ELECTRICAL REVIEW

4th SEPTEMBER, 1953

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ELECTRICAL REVIEW 4th SEPTEMBER, 1953

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. 153 • NO. 10

The Essential Factor

DURING the past years we have seen the Engineering and Marine Exhibition, which, with over 500 exhibitors, was opened at Olympia yesterday and is surveyed elsewhere in this issue, grow and change in character from a mainly marine and essentially mechanical exhibition to a general engineering display in which the electrical note predominates. The great prominence attained by electricity is the result not so much of the increase in the quantity of electrical equipment displayed, although this has been considerable, but more by the permeation of electrical applications into every other branch of engineering.

Coincident with these changes there has grown up, particularly since 1939, a need for greater productivity—a need which has been stressed in most of the larger exhibitions held since the war. This aspect of increasing productivity automatically carries with it further electrical advance, so that at Olympia there is ample evidence of the almost complete reliance which is placed upon the electrical industry by the general engineering industry or, indeed, by production in its broadest sense.

To mention only a few of the ways in which electricity is being shown to exert a powerful influence on production there is first the inimitable electric drive which, apart from its own outstanding merits, is being brought into ever increasing ascendancy by the advances in control technique. In this connection almost every new move enhances the value of the older method rather than replaces it. These comments on controls apply particularly to electronic developments. Then, of course, there is the adaptability of electric heating, many instances being shown in which this electrical application has resulted in self-contained equipment, and here again the service is raised in value by electric control, particularly thermostatic control. The movement during production of raw and processed materials represents a very high proportion of the production costs. It is shown in the Exhibition how this expense

can be substantially reduced by modern materials handling methods with electrical operation and control—especially automatic sequence control. One other important field in which electricity has exerted tremendous influence is welding. The really excellent display of electrical equipment in the separately organized welding section at Olympia represents collectively, we should say, electricity's greatest contribution to speeding-up production.

E.T.U.—N.F.E.A. DISPUTE

After a brief resumption of work on Monday last the " guerrilla " strikers of the Electrical Trades Union came out again on Tuesday. It had appeared from the agreed statement issued last week on behalf of the E.T.U. and the National Federated Electrical Association that obstacles to further discussion of the Union's claim for a " substantial increase " had been got over, but it seems that at Monday's meeting of the two parties the Union demanded immediately either an offer or a flat rejection. The Union's position is uncomplicated; its members will naturally back any demand for higher wages. On the other hand those who have to find the money require time to think about it and the N.F.E.A. wanted to consult its members. If this were to be done without undue delay the request was reasonable. The Union's decision to carry on and extend its " guerrilla " tactics was not.

DOUBLE SHIFTS

One reason advanced in favour of the extension of the double shift system of working in industry is that it would spread the electrical demand and by reducing peaks enable generating plant to operate on a better load factor. This is one of the points made in a memorandum circulated by the Minister of Labour (and reviewed in this issue) which studies the various facets of the subject of double shift working. The practice is not applicable to all factories, but it is most desirable where overhead and capital charges are high in relation to labour costs or where the necessity for increased production would otherwise entail factory extensions. Double shift working involves some dislocation of the workers' normal way of living and they must therefore be consulted before the system is introduced, if it is to operate successfully.

HOME ACCIDENTS

Fatalities resulting from electrical accidents in the home seem to have increased slightly last year, numbering 42. Though still only a fraction of the total from other causes, it is a melancholy reflection that practically all accidents attributed to electricity might be avoided if people would only refrain from misusing appliances and from unauthorized or unskilled modification of initially safe circuits. One wonders how long it will be before the Home Office's classified yearly précis of such incidents, which is not of course seen by prospective offenders themselves, will begin to have the hoped-for effect in view of the increasing use of electricity in domestic premises.

RESUSCITATION

A letter in our last issue from the Secretary of the Yorkshire Electricity Board recounted the prompt action of one of the Board's employees in reviving a man who was apparently drowned. Mr. Dodds' conclusion was that this showed the value of the training given by the Board in artificial respiration but the incident also draws attention to the fact that people saved from the sea and those who have sustained electric shocks can be saved even if they appear to be dead. In this case the victim was " brought round " in a quarter of an hour but many more lives could have been saved if the appropriate treatment had been prolonged when there appeared to be no hope of success.

Developments at the

Radio Show

Exhibits Emphasize Industry's Output in Many Fields

By W. E. MILLER, M.A., M.Brit.I.R.E.

THE twentieth National Radio Show opened on Wednesday last at Earls Court, and will continue until Saturday, 12th September. The organizers, the Radio Industry Council, have continued and even developed their post-war policy of making this event much broader in its conception than a mere display of radio and television receivers and accessories; hence the use of the word "Show" in its title, rather than "Exhibition." Interspersed with the trade stands on the ground floor, and also set out on the first floor, are displays which emphasize many of the wider aspects of electronics and provide interesting and in many cases entertaining features for the large number of visitors expected.

Once again the B.B.C. is operating extensively at the Show. It has a radio and television studio with an 800-seat auditorium in which ten full-scale sound programmes and eight television programmes are being staged during the ten days' run of the Show. This studio also contains a 21ft by 16ft cinema-type television screen mounted above the proscenium, so that the studio audience can see not only the action on the studio floor, but also the picture actually transmitted.

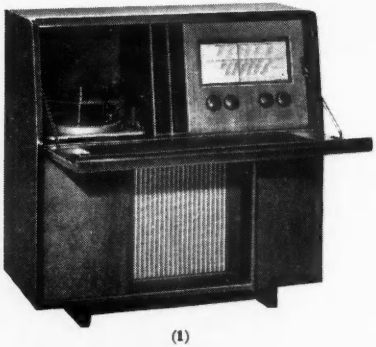
The B.B.C. also has a large stand on the first floor containing many displays intended to show the visitor some of the work which goes on behind the scenes. Engineers from the B.B.C. Training Establishment demonstrate methods used to investigate certain engineering problems.

Last year a technical training exhibit was provided for the first time. This is repeated and six technical colleges and training establishments are staging some interesting experiments carried out by students. A new leaflet on careers in the radio, television and electronics industry is available, and it is hoped that many young visitors will thereby be attracted to an industry which, already extensive, is still rapidly growing, and needs a large intake of trained men.

The Radio Industry Council has also secured the co-operation of the Army, the Royal Air Force, the General Post Office and other Government establishments and commercial firms in staging many interesting working exhibits showing the use of electronics in the Services, in the air, at sea, in industry, in business, in medicine and in other spheres.

Turning now to the commercial exhibits, on which the Radio Show is based, there are just over a hundred firms showing the various radio and television receivers, radiogramophones, tape recorders, and components and accessories manufactured for the domestic market, as well as many exhibits of export models. Incidentally, last year the radio industry exported goods to the value of nearly £25 million, including nearly £6 million worth of radio receivers and radiograms. Nearly 30 per cent of radiograms exported in 1952 went to the United States, as well as large quantities of gramophone components, automatic record changers, public address and high fidelity sound reproduction equipment.

With the prospect of a million TV receivers being made for the home market this year (the number was 800,000 in 1952) it is natural that television should be very prominent at this year's Show. The success of the Coronation programmes, which were a triumph for the B.B.C., has made the general public very conscious of television, and it is expected that a record number of visitors to the Show will be there with the definite intention of selecting a



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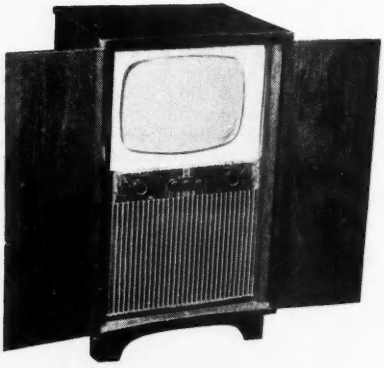

(2)

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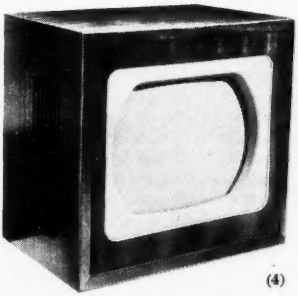
receiver to buy during this autumn or winter.

Recent publication of the B.B.C.'s plans for alternative television programmes, and the possibility of competitive television transmissions, has raised doubts in the minds of some prospective buyers as to the advisability of purchasing a receiver which might become obsolete in the near future. The Radio Industry Council says, however, that all television receivers exhibited at the Show this year are capable of being modified to receive any future programmes in black and white which may result from B.B.C. or other developments in transmission. They already are designed to receive on any of the five existing B.B.C. frequency channels, and if, in the course of time, transmissions are made on the higher frequency bands, conversion facilities for 1953–4 sets will be readily available. In any case, developments involving any change in existing receivers are not likely to occur within eighteen months, if then.

This year 36 manufacturers are exhibiting just under 190 different television models. It is interesting, year by year, to see what changes have taken place in the picture sizes of television receivers. Last year the 12in circular-faced direct-view tube was still the most popular, though it was being challenged by the 14in and 17in rectangular types. (The sizes of rectangular tubes are quoted as the length of the diagonal in each case.)

An analysis of this year's receivers discloses the interesting fact that not only



(4)

(1) An example of the modern bureau-type radio-gramophone (Ferranti). (2) This Ferguson TV console, with 17in rectangular tube, has an illuminated "Halo Light" surround to the picture. (3) Several examples of contemporary-styled radio-gramophones are to be seen. This is an "Ekco" model. (4) This English Electric table television receiver employs the company's own 6in circular tube

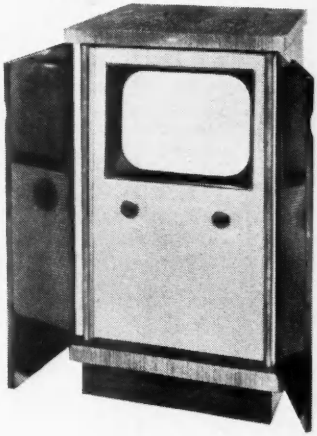
has the 12in tube been deposed from first place, but the 14in rectangular tube has also been overtaken (in number of models shown) by the 17in rectangular type. Approximate percentages of tube sizes are: 17in, 35 per cent; 14in, 27 per cent; 12in, 12 per cent. Circular 15in tubes are used in about 10 per cent of the models, there are a few 16in types, two 21in types, while at the other end of the scale, the erstwhile popular 9in set has, with one exception, disappeared. Projection models have not continued to grow in numbers, for there are only about fifteen in the Show, and many of these are large front-projection receivers giving a picture on a separate screen measuring about 4ft by 3ft. About half-a-dozen firms still show home model back-projection sets, however.

Although the 17in models head the list in numbers, it is likely that 14in and 12in models will still be bought in large quantities, if only because of their lower price. Considering only table models, the 12in tube set costs this year from 46 to 59 gns, the 14in from 59 to 65 gns, and the 17in from 72 to 83 gns.

This year all tubes are either provided with "ion traps" or have aluminized screens, or both, to avoid the risk of circular dark "ion burn" patches appearing in the centres of the tubes after a period of use. Tetrode tubes are replacing the earlier triodes, and the "scan) angle" tube (with a 70 deg angle of wide is almost universally used. One manufacturer demonstrates a tube with a 90 deg scanning angle, while another shows one employing electrostatic focusing, which eliminates the need for the usual external focusing coil or magnet system. Many tubes now have tinted faceplates, avoiding the necessity for a filter for viewing in a fairly bright room. In general, the screens of modern tubes are becoming almost, if not perfectly, flat. Permanent magnet focusing is now achieved by two ring magnets of "Ferroxdure," whose relative spacing can be varied, thus altering the field strength. Sets with automatic focusing are also shown.

As has already been mentioned, all modern television receivers can be adjusted to receive on any of the five B.B.C. channels. Either by changing plug-in coil units, by adjustable trimmers or by channel switching, this can readily be carried out, if not by the owner, at least by the radio dealer. This is a big advantage should the set owner move from one locality to another served by a different transmitter.

Those who live in "fringe" areas where the signal strength is low and often variable are well served by the manufacturers this year. In the first place, the aerial makers have produced some highly sensitive fringe area designs; secondly, fringe area models of most receivers are available incorporating additional r.f. amplification; thirdly, line synchronizing circuits have been developed to avoid the ragged edges to pictures produced by a high level of interference on a low strength signal; and fourthly, automatic vision gain control is used in many sets to bring a fading signal up to a fixed



Above: **A Regentone combination instrument, with 17in tube television, all-wave radio, and gramophone with automatic changer**
Right: **G.E.C. modern-type TV console, with doors folding back flat with the sides of the cabinet. It has a 14in rectangular tube**

level. This last development also helps to eliminate picture " flutter " due to passing aircraft, though some manufacturers also fit an independent " flutter " reducing circuit.

All receivers now have interference-reducing circuits for sound and vision, but the only complete cure for interference trouble is by suppression at the source and several of the exhibitors show suppressors for electrical appliances specially designed to deal with interference on television.

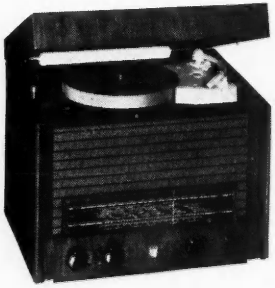
Many of the older receivers had a tendency to show the familiar sloping frame flyback lines on the picture if the brightness control was advanced beyond a certain point. Some sets now contain a flyback suppression circuit enabling a wider range of the brightness control to be used.

An interesting development shown by one exhibitor is a luminous surround to the picture tube, adjustable in intensity, which is claimed to provide more comfortable viewing over long periods, and to enhance the picture. The surround, of translucent plastic, is rear-illuminated by a cold cathode fluorescent tube.

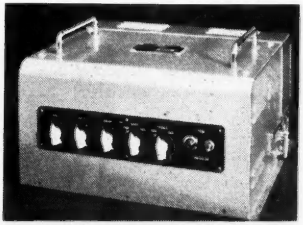
The picture detail and line interlace of modern receivers leaves little to be desired, as will be observed by examining receivers operating side by side in Television Avenue, on the first floor of the Show. This year about 100 receivers are included in this feature.

With all the accent on television, it must be remembered that there are still 10½ million radio-only licences in existence, while many TV viewers are becoming more selective, and are going back to sound programmes when the television is not to their liking. There must be millions of

Table radiograms now enjoy wide popularity. Philips display this new model

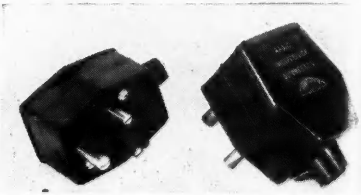


This Roberts Radio portable set is produced in three types—for operation by batteries alone, a.c. mains alone, or batteries and mains



A new versatile power amplifier (Trix Electrical) providing up to 30 W output for public address and similar use

Boosey & Hawkes tape recorder operating with a spring motor and dry batteries for the amplifier



This hard-rubber mains plug by Dubilier incorporates a radio interference suppressor

radio receivers in the British Isles which are almost completely obsolete and should be replaced by modern types. Consequently, the manufacturers are still producing some very fine ranges of radio receivers, in which the use of modern components and circuits, together with the latest types of loudspeakers, results in excellent quality of reproduction. Even small table models and portables to-day have a performance which would have been impossible a few years ago, while many of the larger consoles and radio-gramophones fully merit that much-used description, " high fidelity."

Practically all radio-gramophones at the Show are of the three-speed type, and the proportion using automatic record changers (now highly developed and moderately priced) is higher than ever before. The growth in the number of table radiograms continues, and some of these are also fitted with auto record changers. Record players, for use with existing radio receivers, are shown on many stands, and are nearly all three-speed types, fitted with lightweight pick-ups. The latter are often of the " turnover " type, containing two piezo-electric crystal cartridges, each fitted with the appropriate sapphire stylus for reproducing either standard or long-playing records.

Tape recorders are shown on many stands this year, and range from relatively inexpensive " decks " for home use to specialized types for scientific, industrial or Service use. Many of the domestic types employ twin-track recording on the single magnetic tape, and they are usually two-speed models giving extra running time for speech, or higher quality of reproduction for music recording. Two firms show portable recorders which do not need a mains supply for operation.

Although the use of transistors to replace the conventional type of valve has not yet entered into domestic receiver design, germanium crystal diodes are already in use in certain television receivers. In addition, several valve manufacturers are showing transistors in use in experimental units, while they are incorporated in some of the specialized Service equipment.

Loudspeakers continue to improve in detail, mainly in connection with their permanent magnet systems and cone and suspension arrangements. Components exhibited indicate the current tendency towards " miniaturization " coupled with wide extremes of safe working temperature,

Television aerials appear in various new shapes. This Belling-Lee "Kay-rod " uses one of the lower elements as the support arm

brought about primarily by the needs of the Services. However, the range of components on view does not represent the full capabilities of the components industry, which has its own annual exhibition earlier in the year. Many of the components that are to be seen are suitable for use by the home constructor, whose numbers, after some years of shrinkage, now seem to be increasing again. Several types of television receivers, and even a tape recorder, can now be built at home using the components and parts on view at the Show.

NEXT WEEK'S EVENTS

Monday, 7th September, to Thursday, 10th September

LONDON.—Old Horticultural Hall, Vincent Square, S.W.1. Chemists' Exhibition.

Monday, 7th September, to Friday, 11th September

LONDON.—Olympia. Chemical Engineering Conference.

Monday, 7th September, to Saturday, 12th September

LONDON.—Central Hall, Westminster. International Congress of Physical Therapy and Exhibition of Electromedical Equipment.

Tuesday, 8th September

MANCHESTER.—Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, Manchester Branch. Film on atomic warfare and Civil Defence in co-operation with the municipal authorities.

Wednesday, 9th September, to Saturday, 19th September

CARDIFF.—Sophia Gardens Pavilion. Welsh Industries Fair.

Thursday, 10th September

NEWCASTLE-UPON-TYNE.—Roadway House, Oxford Street, 7 p.m. Incorporated Plant Engineers, North-East Branch. " Maintenance Costs," by H. Whitfield.

Diesel-Electric Locomotive Tests

Report on Performance and Efficiency

BULLETIN No. 9 recently issued by British Railways, Mechanical and Electrical Engineers' Department,* contains a detailed report on the performance and efficiency tests carried out on a 1,750 h.p. main line diesel-electric locomotive on the Southern Region system under the direction of Mr. R. A. Riddles, member (Mechanical and Electrical Engineering) of the Railway Executive. The bulletin is the first to be issued for a non-steam locomotive, and it is set out to display the whole range of capacity, fuel consumption and efficiency of a representative main line diesel-electric locomotive. Under test the locomotive was in the form of its original design, except that a change of gear ratio was made between the different series of trials.

The locomotive in question (No. 10202), which was produced by the English Electric Co., Ltd., was completed in August, 1951, and, after a period of trials and adjustments, was put into regular service on passenger trains between Waterloo and Exeter in October, 1951. It is now normally employed between Waterloo and Exeter and Weymouth, making two round trips on one of these routes each day for six days a week.

Nature of Tests

Two types of test were conducted: Service tests were in the nature of observational tests on revenue earning trains in order to obtain average performance and efficiency values; while analytical tests were designed to evaluate fuel consumption related to drawbar tractive effort and horse power and the immediate commercial purpose of relating loadings to obtain maximum operating efficiencies, and to evaluate also transmission characteristics and efficiency factors of particular importance in design.

Both types of tests were carried out with the Western Region dynamometer car attached to the locomotive, a precision oil meter being fitted which registered electrically on the distance-base and time-base records of the dynamometer car. The outputs of the main and auxiliary generators were observed at short time intervals by metering equipment arranged on the locomotive.

Waterloo-Exeter Route Chosen

The trains chosen for the service tests were the 1 p.m. from Waterloo to Exeter and the 7.30 a.m. from Exeter to Waterloo, each with several stops. Tests were carried out on two trains in each direction. Working in the highest notch (8) was required by the schedules for these loads for most of the time that the locomotive was working with a measurable force exerted at the drawbar; e.g., on one test run the locomotive was worked in notch 8 for 75 per cent of the time under power. Oil consumption per drawbar h.p./hr graphs show that working in the highest notch is fully justified. The highest drawbar efficiency shown for this or any position is about 13 per cent at 85 m.p.h. Further, the average h.p. at the drawbar of from 66 to 76 per cent of the total h.p. was recorded in notch 8 working. Although these tests took place when the gear ratio was 52 : 21, with only one stage of field weakening, it is considered that the average values of consumption and efficiency are not unrepresentative of the locomotive as now arranged with a gear ratio of 65 : 17 and two stages of field weakening.

The route chosen for the analytical tests was that of the S.R. main line between Exeter and Salisbury. The tests occupied four days, during which the daily loading varied between 390 tons for working in notches 7 and 8 and 61 tons for working in notches 3 and 4. The maximum starting effort is 34,700 lb which, adjusted for the gradient component of the weight of the locomotive, is equivalent to 37,820 lb on the level at the moment of starting.

Although nominally in notch 8, the performance is that of notch 7 up to about

* Price 10s from the Railway Executive, 222, Marylebone Road, London, N.W.1.

17 m.p.h. When comparing the effort corresponding to the generator output with the effort at the drawbar the difference was invariably found to be relatively high when the speed was low and the current was high.

The maximum measured output of the main generator was 1,145 kW at 635 V and 1,803 A in the weak field of notch 8 at a train speed of 42 m.p.h. For these conditions the inclusive oil consumption of the engine was found to be 0·62 lb per kWh of the main generator, which is 0·596 lb per kWh of the combined generators.

Conclusions drawn from the tests are that besides exhibiting the high overall efficiency expected where a diesel prime mover is used, that efficiency is maintained over a wide range of train load and running speeds, making the locomotive very suitable for mixed traffic working. The considerable choice of notches for the lower powers and speeds is valuable in handling heavy loose coupled freight trains, but there is a part of the characteristic in the high power and speed area which is not well divided by intermediate notches. This might lead to some loss of flexibility and is a point for which future attention is recommended in locomotives of this type.

The report is profusely illustrated with graphs and tables.

Engineering in Europe

Survey of Current Literature

THE classic sphere spark gap, still the standard instrument for measuring high voltages, the use of which is internationally agreed upon, has some obvious advantages, among which its rapid response, its simple mode of operation and structure are noteworthy. However, its chief drawbacks are that it is unsuitable for measuring effective (instead of peak) values and for continuous measurements and, even more, its considerable space requirement. Many workers have suggested substitutes for the sphere spark gap; the best principle was pointed out by Chubb and Fortescue 40 years ago: the use of a standard h.v. capacitor connected through a synchronizing switch to an accurate d.c. or electrostatic instrument.

Arrangements based on this principle have been carried out in research laboratories and also commercially, but despite some advantages in operation, none of these set-ups could be used for all the purposes intended, so that the author and his co-workers found that only a combination of the various apparatus previously suggested could represent a full equivalent of the sphere spark gap and also be used for measuring effective values of alternating voltages. A detailed description of the "measuring block" designed by the author and permitting an alternative use of the various instrument combinations is given. The block thus enables the workers to compare measurements of the same phenomenon made with different combinations of instruments and to calibrate one combination by means of one or several alternative combinations.—"Voltage Measurements in H.V. Laboratories," A. Mattias, *E.T.Z.(A)*, Vol. 74, No. 11, pp. 322–327, 1st June, 1953, in German.

Generator Earth Fault Protection

Short-circuit to frame, the most frequent fault occurring on h.v. generators, is due to a breakdown of the insulation of one phase to the earthed stator. In a system with isolated neutral this will only send the capacitive earth-fault current through the fault and in an indirectly earthed system the residual active current component of the system. These currents are in many cases not more than a few amperes, and are therefore rarely harmful to the stator iron, but may endanger the insulation of the phase affected. Currents greater than 20 A are dangerous for the stator laminations as well, even if they are of short duration.

The protective systems available differ for generators in block connection with a transformer and for generators operating

directly on busbars (without transformer). Faults to earth on the h.v. side produce a neutral point displacement on the l.v. side which is used for detecting short-circuits to earth. In a generator-transformer block the protection usually works with a five-limb transformer between generator and power transformer the secondary winding of which is in open delta connection and combined with a sensitive current or voltage relay. This affords about 90 per cent protection (except for earth faults of the neutral or in its immediate vicinity).

By a more elaborate arrangement, which is fairly expensive, total protection (including the generator neutral) is attainable, but may not always be economically justifiable. For generators working on to busbars this system cannot be used, but circuits employing either three current transformers with series-connected secondary windings and an earth-fault relay, or a differential protection with current transformers, are a suitable protection, particularly if combined with error-current compensation.—" Protection of Generators against Short-Circuits to Frame," B. Westphal, *Siemens Z.*, Vol. 27, pp. 134–141, April, 1953, in German.

Transmission Line Insulation

A line insulation capable of withstanding internal overvoltages will enable the lines to be rendered lightning-safe at a reasonable cost of the earthing installations. The insulation levels are determined from $U_{wet} \geqslant k\ U_{Int}$, where U_{wet} is the wet flashover voltage of an insulator string, U_{Int} the effective value of the internal overvoltages, k the transition coefficient between acting and withstand voltage (U_{Int}/U_{wet}). This relation is used for determining the number of elements of a string. There is an accepted rule for determining the coefficient k for normal atmospheric conditions, and thundery conditions may be taken into account by a certain safety factor.

A long series of switching tests on idling lines in various countries was evaluated, with the result that the line insulation should withstand 3·1–3·3 times the phase voltage, and the wet flashover voltage of the external substation insulation be of the order three times phase voltage. The wet flashover voltage of the line insulation should be 20 per cent higher than that of the external substation insulation. The wet flashover voltages of the insulator strings of 154 kV lines have a relative dielectric safety factor 14 per cent higher than the strings of 110 and 220 kV lines. The statistics of Soviet power systems show that the proportion of insulators to be replaced annually is below 0·2 per cent, the number of strainer insulators being about three times as high as that of supporting insulators owing to the higher mechanical stresses.—" Insulation Levels of 110–220 kV Transmission Lines on Metal Masts," V. A. Volkenau and A. N. Sherentsis, *Elekt. Stantsii*, Vol. 23, No. 2, pp. 32–34, February, 1953, in Russian.

Cable Fault Location

In laboratory and service tests the method of oscillatory discharges has been found suitable for fault location on power cables after transient failures with puncture and it has the advantage that no burning-out of the fault is required. The position of the fault is obtained by charging the tested cable with a constant voltage through a charging resistance. If the insulation is defective, application of a certain voltage between core and lead cover will lead to a puncturing discharge at the point of the defect. The fault resistance is obviously low and independent of the voltage applied (fractional ohms).

The puncture of the insulation with its low residual resistance sets up an oscillatory discharge which may be observed on an oscillograph. The period of the oscillation will be $T = 4\ l/v\ \mu sec$, where v is the velocity of propagation of the waves along the cable (for 6–10 kV cables of 16–500 mm² section on an average $1{\cdot}6 \times 10^5$ km/sec), l being the distance of the fault from the sending end. If T is measured in μsec, and v in m/μsec, we have the simple relation $l = 40\ T$ for determining the distance to the fault. Since the range of natural oscillation frequencies for cable lengths of 40–4,000 m is 1 Mc/s–10 kc/s, the detection and location apparatus must be carefully designed. The apparatus described is claimed to measure distances of the fault up to 2 km within error limits of $\pm$ 20 m.—" Fault Location after Transient Breakdowns of Cables by the Method of Oscillatory Discharges," V. K. Spiridonov, *Elekt. Stantsii*, Vol. 24, No. 1, pp. 40–44, 1953, in Russian.

[Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.]

VIEWS on the NEWS

By REFLECTOR

IN their August *News Letter* the Friends of the Lake District again tackle the North Western Electricity Board on the subject of supplies to Borrowdale and Langdale which the Board has deferred in favour of schemes likely to benefit a greater number of people. Although the "Friends" insist that in such cases as this some of the lines should be placed underground, they recognize that even with overhead lines these rural schemes are unremunerative.

Their remedy is subsidization by the urban consumers; "otherwise one clear advantage of nationalization is sacrificed." National parks, however, are placed in a separate class; in this case any extra expense of electricity supply should be defrayed nationally. I can agree with the latter suggestion, but as an urban consumer I am not so taken by the first one.

* * *

For some years the Electrical Association for Women has produced little booklets containing recipes—mainly, of course, for housewives with electric cookers. The gas people do the same sort of thing for gas users, the latest being the compilation by the Wales Gas Board of a set of traditional Welsh dishes. But the Board has gone a bit further by appending a list of harpists who (for a fee) are willing to discourse Welsh music during the meal. Does this indicate a need for the revival of the old Electro-Harmonic Society?

* * *

There are people in this country who object to the monopolistic supply of electricity. They think that if more than one authority operated rival systems in an area they would be "kept on their toes" by one another. Of course it would not really work as was discovered in the quite early days of electricity supply. Duplicated systems can hardly operate economically, but there are places where it is possible to attempt to disprove this. The State of Oregon (U.S.A.) is said by the *Electrical World* not to have a franchise law granting exclusive utility rights. "As a consequence any agency, public or private, can elect to undertake electric utility service in competition with any other." The occasion for this remark was the embarkation of a large municipal authority upon the supply of electricity in its area, already served by a private company.

* * *

Let the B.E.A. beware the ides of March. *Old Moore's Almanack* for 1954 contains the following prediction for that month:—

> "Certain outstanding changes affecting Coal, Gas and Electricity will take place. There may be a move away from Nationalization. A possible fall in charges is indicated."

I should say that the last sentence, at least, is a rather rash prophecy despite its cautious wording.

* * *

My attention has been drawn to an information bulletin issued in connection with the Foire de Paris. I see from this that:—

> "Many of the famous castles of France, especially those built in the valley of the Loire, now have voice. Brilliantly illuminated, with floodlit battlements standing out against the night sky, by the aid of loud speakers ancient castles tell their story to the thousands of tourists and sightseers gathered before them. Chambord, with blast of military music, invites the visitor to listen to its story. A voice on the still night air recites its past, its scenes in which Francis I and so many other famous people took part. When the story records the passing of a great figure, the lights go dim, to leap up again into brightness as the story of another life is unfolded."

The note is headed "Will Hampton Court Follow?" To which I can only reply "I hope not!"

PERSONAL and SOCIAL

News of Men and Women of the Industry

FOLLOWING the announcement of the formation of the stud welding organization of Crompton Parkinson, Ltd., for the unified sales and servicing of both "Nelson" and "Cyc-Arc" stud welding equipment, it is now further announced that **Mr. F. Foster,** M.Sc., A.M.I.E.E., holds the position of general manager, with **Mr. R. W. Taylor,** A.M.I.E.E., M.Inst.W., as sales manager (home). Mr. Foster was previously general

Mr. F. Foster

Mr. R. W. Taylor

manager of Crompton Parkinson's "Cyc-Arc" stud welding division which has now been absorbed into the new organization, jointly with the "Nelson" stud welding division. Mr. Taylor was previously product sales manager of the "Nelson" stud welding service, and before joining Crompton Parkinson he was sales manager to Cyc-Arc, Ltd.

Mr. H. A. Engleman, of 206A, Park Drive Manor, Philadelphia 44, U.S.A., will be in this country during October with the object of conferring with British manufacturers interested in long range marketing opportunities in America.

Mr. H. Green, managing director of Horace Green & Co., Ltd., celebrated his seventieth birthday on 21st August, and to commemorate the occasion his 150 employees presented him with an easy chair.

Mr. R. M. Hilary, M.B.E., T.D., is joining D. Napier & Son, Ltd., this month, as commercial manager. He will co-ordinate and develop all the Napier organization's commercial activities at home and overseas.

Following the recent appointment of **Mr. A. E. Lawson** as assistant sales manager, two further sales appointments are now announced by the Gramophone Co., Ltd. **Mr. C. E. Walker** has been appointed southern area manager and **Mr. F. G. Wigmore** assistant to Mr. S. Davies, the sales manager.

Mr. R. Hatton has been appointed sales manager to the new Recording Equipment Division of E.M.I. Sales & Service, Ltd., with **Mr. R. J. Wood** as assistant sales manager and **Mr. W. H. Y. Grainger** as sales engineer.

Mr. J. J. Hammond retired last week from the board of Oldham & Son, Ltd., after serving the company for fifty-four years. A special tribute was paid to Mr. Hammond by the chairman (Mr. John Oldham) at the company's annual meeting, and afterwards the directors and executive entertained Mr. Hammond at luncheon when the chairman presented him with an engraved silver salver.

Mr. C. G. White, export manager of the Ever Ready Co. (Great Britain), Ltd., has been elected to the board of the company.

The Industrial Electrical Co., Ltd., announces that **Mr. John R. Radington-Meech** has been appointed chairman and managing director, **Mr. Eric Clark,** director and secretary, and **Mr. Herbert Jenkins,** director and general manager.

Mr. L. H. Finedon, home sales executive of Morphy-Richards, Ltd., with whom he has been for fourteen years, has resigned to take up the position of commercial manager with Remploy, Ltd., 25, Buckingham Gate, London, S.W.1. Mr. Finedon commences his new duties on 14th September.

Mr. A. G. Marsh, export manager of Agro Electrical Co., Ltd., retired at the end of August. Before joining Agro he occupied a similar post with T.M.C.-Harwell (Sales), Ltd. His association with the company goes back to the early 1920's.

Mr. J. W. Stevens, who has served on the board of the Express Lift Co., Ltd., and has occupied a managerial position with the company since its formation, retired on 31st July.

Mr. Charles M. Escaré, chairman of the Escaré Art Metal Co., Ltd., was entertained on Friday by his fellow directors and executives at a luncheon on the occasion of his eighth birthday. Mr. Escaré, who is still actively

engaged in the business, founded Escaré & Denelle, Ltd., many years before the 1914-18 war. The business was later amalgamated with N. Burt & Co., Ltd., under the style of Burt, Escaré & Denelle, Ltd. Those present at the luncheon were Miss E. A. Grieve, Mr. W. F. Malpass, Major W. G. Pringle, Mr. W. Russell-Owen, Mr. W. H. Hitchman, and Mr. C. H. Schreiber.

Mr. E. A. Dorling, A.M.I.E.E., has been appointed senior sales engineer with Ioco, Ltd., and will be dealing with the company's electrical insulating materials and laminated plastics.

Mr. F. G. Thomson has been appointed manager of the Lamp Department of the London branch of the Stearn Electric Co., Ltd.

The next production of the **Portland Players** (B.E.A.) is to be "Across North Africa with a Pelican," at the Cripplegate Theatre, London, E.C.1, on 15th and 16th September.

Mr. A. G. Bogle, B.E.(Hons.), D.Phil.(Oxon.), A.M.I.E.E., A.M.N.Z.I.E., has been appointed to the newly established Chair of Electrical Engineering at Auckland University College, New Zealand.

OBITUARY

Mr. Charles Curwen, managing director of Buchanan & Curwen, Ltd., of Victoria Street, London, S.W.1, died on 26th August, at the age of seventy-seven. Mr. Curwen founded the business in 1895 and was one of the pioneers of the electrical contracting industry, being responsible for many important electrical installations in London and in various parts of the country. He was a member of the Salters' Company in the City of London and was its Master in 1944-45.

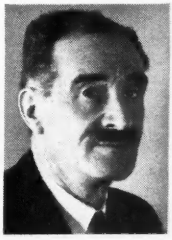
Mrs. F. T. Alldread, a director of George E. Taylor & Co. (London), Ltd., died on 30th August after a long illness. Mrs. Alldread was connected with the electrical contracting industry for over fifty-two years.

Mr. R. Prince.—The death is announced of Mr. R. Prince, southern area district manager of W. T. Glover & Co., Ltd. Mr. Prince, who was a native of Accrington, joined the company in 1946.

William Oliver Fenwick

IT is with great regret that we have to announce the death of Mr. William Oliver Fenwick, our Technical Editor. His health had given cause for anxiety for some time but he was attending the office as recently as Friday last. That evening he collapsed and was taken to the West Middlesex Hospital where he died early on Saturday morning.

Mr. Fenwick was born in Cairo (Egypt) in 1893 and received his technical education at Faraday House, being awarded the diploma of that institution. He served for about a year in the drawing office of Fielding & Platt, Ltd., and in 1914 joined the Bristol Corporation Electricity Department as assistant mains engineer, later becoming assistant power station engineer. He left Bristol in 1917 to take up the position of assistant plant superintendent at the Ailsa Craig Shell Factory.



The late Mr. W. O. Fenwick

In the following year he joined the staff of the *Electrical Review* as assistant to the late Mr. A. H. Allen, the technical editor. He continued as assistant technical editor when Mr. Allen, who died in 1929, was succeeded by Mr. C. O. Brettelle (now our technical consultant). When the latter retired in 1948 Mr. Fenwick was appointed technical editor.

Thus for thirty-five years Mr. Fenwick had loyally served the *Electrical Review* and by his assiduous attention to this journal's interests won it many more friends. He became an associate member of the Institution of Electrical Engineers in 1918 and a member in 1942 and he was an enthusiastic supporter of the Institution, becoming the close friend of many fellow members and a familiar figure at all Institution gatherings. He was also well known at the St. Stephen's Club of which he was a member. Mr. Fenwick's outside activities included membership of the B.S.I. Committees on electrical symbols and abbreviations for which long experience in electrical journalism had admirably equipped him.

The directors of the *Electrical Review* and Mr. Fenwick's colleagues on the staff have long appreciated his determination and courage in carrying on his work in spite of his poor state of health and he will be greatly missed by us all.

Our sympathies go out to Mrs. Fenwick and in this we know we will be joined by the many readers who met her when she accompanied her husband at numerous electrical conferences and social events.

The funeral service took place yesterday (Thursday) at St. Mary's Church, Isleworth, and cremation at Mortlake.

Contracting Industry Dispute

AFTER the intervention of the Ministry of Labour the members of the Electrical Trades Union employed at twelve sites in various parts of the country who were called out on strike last week were told by the Union to return to work. Reporting on the talks which took place between officials of the Ministry, Mr. L. C. Penwill, director and secretary of the National Federated Electrical Association, and Mr. W. C. Stevens, general secretary of the Electrical Trades Union, the Ministry stated that in the discussions Mr. Penwill emphasized that the Association had throughout been ready at any time to meet the Union in accordance with the accepted constitution of the National Joint Industrial Council to discuss any matter the Union wished to raise and it was quite incorrect to say that his Association had refused to meet the Union except to explain the reason for the rejection of the wage claim. Mr. Stevens said that he felt he had been perfectly justified in interpreting the letter of 10th June as restricting any talks to an expansion by the Association of the reason for which it had rejected the claim.

Recent correspondence had made it clear, and the talks confirmed, that both parties were willing to arrange for a continuance of the negotiations and a statement was agreed. This was to the effect that as the Union had intimated that negotiations on its claim for a substantial wages increase and last discussed jointly with the Association on 24th March should be continued, and as the Association had indicated that in accordance with its normal policy it was prepared to meet at any time to hear and consider any submissions which the Union desired to make in respect of wages, it was jointly agreed that an early meeting of the N.J.I.C. should be called to enable the discussions to continue without any restriction on either side as to the manner in which the claim of the Union was pursued or dealt with and without either party committing itself in advance as to its eventual outcome.

The men returned to work on Monday but following a three-hour meeting of the National Joint Industrial Council which ended in deadlock it was indicated that the strike would be resumed and possibly extended.

A statement issued by the N.F.E.A. said that at the meeting Mr. Stevens presented the Union's case for an increase in wages based solely on the cost of living index. The Association representatives retired to consider the position and upon resumption stated their anxiety to give further consideration to the case submitted and consult immediately their 93 branches. They offered to ensure that the meetings of all the branches should be held in the next week or ten days so that negotiations could be resumed during the week commencing 14th September. The offer was refused, whereupon the Association said that they would explore the possibility of bringing the date forward, it being pointed out that such consultation was the normal practice.

The Union representatives replied that they had every right to assume that the Association side constituted a negotiating committee and that the negotiations should be carried through and finalized that day, either in the form of an offer to increase wages or a rejection of the claim. Mr. Foulkes then stated that the Union would have to consider reverting to the position as it was immediately before the meeting with the Ministry of Labour on 26th August.

The Association intimated that they would be willing to join with the E.T.U. in referring the matter to arbitration and to accept the findings of the arbitrator.

On behalf of the Union it was stated that the E.T.U. representatives were authorized to conclude agreements and the employers' spokesmen should be also. The Association's attitude, they considered, made a farce of negotiation.

Physical Therapy Congress

THE first congress of the World Confederation for Physical Therapy will be held in London (Central Hall, Westminster) from 7th to 12th September, under the presidency of Miss Mildred Elson, the first president of the Confederation and president of the American Physical Therapy Association, and with the Chartered Society of Physiotherapy of Great Britain acting as hosts.

On each day of the Congress papers will be read and lectures given on the applications of physical therapy to various disorders and diseases and study visits will be made to various hospitals, rehabilitation centres, factories, etc., where authorities will talk on and demonstrate apparatus installed, including, in some cases, electro-medical equipment. For instance, at the Medical Rehabilitation Unit, R.A.F. Station, Chessington, Surrey, on Tuesday next, 8th September, S/L. C. B. Wynn Parry, B.A., M.B., will talk on the use of electronic apparatus and demonstrate various types of equipment, including the R.A.F. electronic stimulator Type 2—a combined treatment and diagnostic set providing a wide band of pulse durations suitable for accurate plotting of intensity duration curves and for electrotherapy.

In conjunction with the congress and in the same building a small trade exhibition will be held, and among the exhibitors who will display electro-medical apparatus are: Cox-Cavendish Electrical Co., Ltd.; Stanley Cox, Ltd.; Electro-Medical Supplies (Greenham), Ltd.; C. J. Fox & Sons (Chemicals), Ltd.; General Radiological, Ltd.; Hanovia, Ltd.; the Multitone Electric Co., Ltd.; Philips Electrical, Ltd.; and Radium Electric, Ltd.

Public Ownership

Views of the T.U.C. General Council

AT the 1952 Trades Union Congress the General Council of the T.U.C. was asked to formulate proposals for the extension of "social ownership" to further industries and services, "particularly those now subject to monopoly control, such proposals to have due regard to the 'Plan for Engineering' of the Confederation of Shipbuilding and Engineering Trade Unions." The General Council pointed to the vastness of the task imposed on it and it was agreed that the Council should prepare "priority plans plus a progress report" for the 1953 Congress (Douglas, I.O.M., 7th–11th September).

This progress report, now issued, mentions the difficulty of obtaining full information about some of the important sections of the country's economy and notes that there is no agreement regarding the most suitable form of public ownership. "It would not be true to say that public opinion is strongly prepared for the transfer of further industries to public ownership. Any proposals for the extension of this form of public control must therefore grow logically and demonstrably out of the experience already gained, and out of the present needs of the community.

Results of Nationalization

There follows a study of the operation of the major industries nationalized since 1945, including coal, electricity and gas. As regards the mining industry, it is considered that nationalization has been successful on the whole but there is said to be a need for more qualified engineers and an increase in the rate of investment. Reviewing the salient features of electricity supply operation since 1945 the report says that the expansion of the industry since nationalization and its increased technical efficiency cannot be denied. It has been able to show a financial surplus while keeping tariffs low enough to make electricity relatively cheaper than before the war. Criticism has been directed against the industry for its inability to keep pace with the demand and its alleged lack of co-ordination with other fuel industries. External conditions have prevented more rapid expansion and criticism of its tariff policy has been dealt with in the Ridley Report.

It is thought that there seems little cause for criticism of the gas industry; any limitations can be explained by reference to external conditions.

With regard to the co-ordination of the fuel and power industries, the General Council refers to the evidence which it submitted to the Ridley Committee. In general the Committee's recommendations were in line with the Council's ideas. Referring to the Government's view that regular meetings between the Minister of Fuel and Power and the chairmen of the boards might be the best way of dealing with co-ordination and tariff principles, the Council says it is now urging the Minister to make an annual report on the progress made.

The conclusion is reached that nationalization has improved the efficiency of operation and aided development in the fuel and power industries. It is recognized that there may have been instances in which managers of more efficient units taken over have found themselves hampered in some degree by the need to fit into the administrative machine and have not been able to take decisions so quickly as before nationalization. These, however, are said to be the exception, not the rule, and there are many improvements to place against this.

The subject of ministerial control is touched upon. It is not clear, says the report, how Ministers have used their power to withhold consent from schemes put forward by nationalized industries. There have been delays but prior informal consultation before publication of plans has prevented the withholding of consent to a published plan. It is mentioned that the Government's restrictions on capital investment have limited the development of some nationalized industries (notably railways and electricity).

Parliamentary control, control by statutory bodies, "informal pressures" and other influences are dealt with and it is concluded that there is a case for simplifying the machinery of control. Stress is laid upon the value of selecting the right persons for the purpose.

Another section of the report deals with industrial relations and in the course of this the subjects of joint consultation and workers' control are introduced. It is said that joint consultative machinery must not be expected to give executive power to workers' representatives.

Other Industries

After a survey of the country's economic position and needs, with particular reference to export trade, the report turns to the further extension of public ownership. There is said to be a clear case for the complete public ownership of water supply and a need for public control of the chemical industry. Engineering is recognized as comprising a number of widely-different branches requiring separate consideration.

The Council also says that electrical engineering is not a single clearly-defined industry but has several interconnected sections, each with its own problems. Several of these sections have been or are being investigated by the Monopolies Commission and the General Council and the Confederation of Shipbuilding and Engineering Unions will be giving further attention to the report of the Commission and to subsequent Government action. Particular importance will attach to the report on heavy electrical equipment because of the place this equipment occupies in raising industrial productivity, in developing the Commonwealth and in providing direct exports. Up to the present there is no suggestion that the electronics industry requires further control.

Dust Sampling

APPARATUS for sampling flue dust which has been approved for use by the British Electricity Authority is dealt with in considerable detail in a memorandum with drawings we have received from the B.E.A. It is based upon a recommendation made by Sub-Committee No. 2 (Flue Dust Measurement) of the Generating Station Operation—Research Liaison Committee, the recommendation having been made after considerable experience of the use of the apparatus, which is of the " two stage " type, the first consisting of a cyclone collector and the second of a glass wool or slag wool filter. The recommendation stressed the necessity for a dry process of collection and the apparatus complies with this requirement in that the dust sampling probe and the separator unit are electrically heated in order to prevent condensation of vapour.

Multipoint dust sampling on the general lines recommended in B.S. 893 : 1940 is envisaged, with reservations in respect of dust and gas velocity distribution across the sampling plane. It is emphasized that the equipment and test procedure which are recommended and described in the memorandum are intended to be used for official tests and for investigations when accuracy and reproducibility are of prime importance.

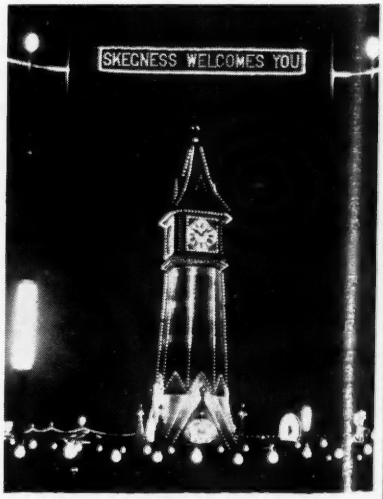
The apparatus is briefly described, after which details are given of the test preparations, followed by details concerning the actual running of the test, while the conclusion is in the form of a number of technical appendices. Throughout the body of the memorandum an attempt has been made to arrange the subject matter in a convenient sequence to correspond roughly to the actual progress of the test.

The typical calculations, which are given in an appendix, are almost in complete agreement with those appearing in the report of the Flue Dust Measurement Sub-Committee. The calculations shown in the memorandum may be performed in a much shorter time and are presented for that reason. At the conclusion of a test, but before laboratory analysis of the coa has taken place, preliminary estimates of the results may be required; in such cases simple and reliable formulæ and nomograms exist and these may be utilized as a temporary measure.

Skegness Illuminations

THE autumn illuminations at Skegness comprise festoon lighting, set-pieces and flower garden lighting along the whole of the sea-front carried out by the Council. A giant " Skegness Welcomes You " sky sign is composed of scarlet letters which come on letter-by-letter, with a " chaser " border. The North and South boating lakes and all the Council's sea-front premises are attractively illuminated. In addition, the Skegness pier is festooned from end to end, with a giant crown over the Pavilion at the seaward end of the pier. The two Butlins amusement parks also have their " big dippers," windmill slides, and wheels outlined in strip-lighting. The *pièce de résistance* is the Tower Gardens scheme, in association with the Francis British Electrical Co. In this natural park, at the centre of the sea-front, there are seven large set-pieces in " three-dimensional " plastic figures, lit from within and in full-colours, and rabbits, squirrels, ducks, caterpillars, pandas, frogs, etc., all animated. To date 100,000 people have paid for admission to the gardens. The illuminations continue until 19th October, and the Council has received assistance from the East Midlands Electricity Board, under its district manager, Mr. F. Payn.

The illuminated Clock Tower at Skegness



CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

"Are Qualifications Necessary?"

I AM pleased to note that "Chartered Electrical Engineer" (*Electrical Review*, 21st August) and I are agreed on the basic issue—the inadequacy of the present salaries paid to engineers in the electricity supply industry—although we appear to agree on little else.

In my letter in your issue of 7th August I pointed out that an organization already exists, officially approved by Act of Parliament and the B.E.A., and which has proved efficacious in the past, that will remedy the complaint just so soon as these engineers will summon up sufficient collective commonsense and energy to call it into action. "C.E.E." on the other hand advances the novel theory that senior engineers sitting on the managerial side of the National Joint Board should do this for him—I trust he will make his ideas known to the authorities and certainly wish him the best of luck in getting them adopted.

"Chartered Electrical Engineer's" attack on the accountant, secretarial and other ancillary services in the industry as "passengers" is most unwarranted and is in my view most unprofessional conduct. I would agree that non-engineering personnel appear to be unduly numerous and seem to possess an alarming fecundity, but this, surely, is the logical result of nationalizing an engineering project along Civil Service lines and that presumably is the responsibility of the politicians. The salaries earned by these officials are certainly not fabulous—they only appear so by comparison, as "C.E.E." agrees.

Our most alarming difference, however, is that we are apparently unable to understand each other's language. I should be most interested to hear by what process of reasoning "Chartered Electrical Engineer" construes my letter as "belittling" the electrical engineering profession—certainly nothing was further from my intention. Perhaps his inability to understand that my first and last sentences are quite compatible provides a clue, in which case I hope, for his own sake, that "C.E.E." has not read my letter carefully, or that he was just not trying.

W. S. WILSON, A.M.I.E.E.

Portishead.

IF certain of your correspondents were responsible for engaging staff, there would be more time spent in changing jobs than in doing work, for employment would be by hit-or-miss. Surely the employer's object is to find the right candidate first time—not to keep "hiring and firing" until he stumbles on a winner?

In the matter of comparing what is offered with what is wanted, paper qualifications are a great help to the employer who knows what they represent. Knowing the kind of training the candidate has undergone, the employer can prepare himself with questions to find what use has been made of that training, and then go on to test suitability for the particular vacancy. Thus the employer ensures in logical steps that he is engaging as an engineer a man trained to think as well as to remember.

From time to time we hear about the right of the Engineer to the same status as the Doctor. Perhaps more regard to training comparable with a doctor's, and firmer insistence on the recognized evidence of that training, would help the public to distinguish Engineer from engineer, and lead to more appropriate reward for the true professional?

*London, N.*10. F. W. ROGERS.

AS a very special favour to quite a number of young, keen and hard-working electrical engineers, will someone please give a common-sense definite answer to the above question.

Of late I have applied for quite a number of posts through the medium of your journal, the positions applied for being of a nature in which I am greatly interested. I am prepared to work exceptionally hard for I realize that my country is in none too

good a shape and it is evident that hard work is what is required. Alas these qualities do not seem to be appreciated any more, if one has not become a graduate or associate member of the I.E.E., and it does lead one to think that he is of no use to industry, although he may have good practical experience and still be pursuing studies to reach A.M.I.E.E. standard. Some of us were set back several years by army service; now we are doing our utmost to qualify as soon as possible. By taking on men who wish to take an interest and work hard both the employer and the country would benefit.

" In a Quandary."

Lamps for Street Lighting

SOMETHING more than *cacoethes scribendi* prompts me to re-enter the controversy in your columns regarding the various types of lamps used for street lighting purposes. While I agree with Mr. Lionel Hill that there is ample evidence of the universal popularity of fluorescent lighting and the rapid growth in its use, in spite of the present high initial cost, the figures which he quotes are misleading and will undoubtedly be challenged by those in favour of the other types.

In making a comparison of the respective costs of the various types, the net price should be used, as all lighting authorities enjoy certain discounts on lamps obtained and used for street lighting. In his assessment he has made no allowance for the periodical renewal of vacuum jackets or starter switches which are used in conjunction with the majority of the present fluorescent installations. The life of a 250 W h.p.m.v. lamp is generally accepted as 3,000 hours and should be taken as such when making comparisons.

Experience with the different types of lamps has shown that, generally speaking, their useful life is up to that referred to in the B.S.I. publications and to assume an average figure of 80 per cent of the nominal life is unduly pessimistic for a large installation. Even when effect is given to the points referred to above and the cost of energy is taken at 1½d/kWh, the overall capital and running costs over a period of 25 years are still substantially in favour of fluorescent.

It is not improbable that those light sources which make it difficult to distinguish true colours and have, taken by and large, reached the zenith of their efficiency, may well become obsolescent within measurable distance of time. When consideration is being given to the installation of new or improved systems of lighting it would be as well for this point to be borne in mind, in addition to initial costs, important though the latter may be in these days of capital restrictions.

" Pro Bono Publico."

Lamp Reversal

REGARDING this quaint idea of reversing lamps in their sockets as suggested by *Tit-Bits* and reported by " Reflector ": I do not wish to disagree with Mr. W. J. Jones on the uselessness of the process, but I must observe that Mr. Jones must have been referring to a 25 c/s supply when writing of " a reversal of polarity *fifty* times a second."

Stanley Lyons, L.S.I.A.

London, S.W.7.

[Mr. Jones agrees that he should have said 100 times a second and regrets the slip.—Editors, *Electrical Review.*]

The Late Professor Parker Smith

YOUR tribute to the late Professor S. Parker Smith expresses well the feelings of those who thought of him as one of the " fathers " of our industry.

This universal regard was shown in an expression current in the 1920's when an electrical installation of outstanding quality and workmanship was known as a " Parker Smith job."

Exeter. W. N. Lavis.

Weather Observation

THE first fully automatic radar sonde equipment now being installed at a new meteorological station in Crawley, Sussex, by Mullard, Ltd., marks a step forward in the observation of weather conditions in the upper air. It will enable measurements of wind speed and direction, temperature, pressure and humidity to be made at ranges of up to 100 nautical miles, at heights of up to 100,000ft and with accuracies hitherto unattainable. The provision of information of this kind, on a world-wide basis, is essential to the future progress of high-flying, high-speed aircraft.

Although the new station is not expected to commence normal operation until later this month we had the opportunity of seeing the equipment recently before its demonstration at the forthcoming S.B.A.C. exhibition.

Engineering, Marine and Welding Exhibition

Survey of the Electrical Aspects

THE list of over 500 exhibitors at the Engineering, Marine and Welding Exhibition, and the Chemical Plant Exhibition, which is being held at Olympia, London, from 3rd to 17th September, indicates the growing popularity of this Exhibition in the general engineering world, and the wide range of equipment shown demonstrates how electricity permeates every other branch of the general engineering industry—by generation and distribution, and by machine driving, equipment heating, plant control, etc. It is our object here to attempt a survey—somewhat difficult because of the great size of the Exhibition—of these electrical aspects and in order to present the whole in some sort of an orderly picture we will deal with the various subjects, as far as possible, in the normal order of electricity generation, distribution and utilization.

BOILER EQUIPMENT

Of particular interest to power station engineers on the stand of International Combustion, Ltd., is a scale model of the company's boiler installation at the Drakelow power station of the British Electricity Authority. Another model shows the application of pulverized fuel corner burners to a water-tube boiler, while an exhibit of the type "L" louvre travelling grate stoker represents the widespread activities of the company in this field.

Some important boiler developments are depicted on the stand of Babcock & Wilcox, Ltd., by models of the 830,000 lb/hr radiant units at present under construction for the Castle Donington power station, and of high head, bi-drum and integral-furnace units. There is also a working model of the "Cyclone" steam separator as used for ensuring dry steam under all conditions in both land and marine applications.

Another boiler display is the "Turbine" furnace on the stand of the Turbine Furnace Co., Ltd. With its sub-divided grate, ensuring even air distribution, it is shown fitted to a Lancashire boiler. The left-hand flue furnace has a grate arranged for mechanical firing by means of a shovel type stoker, while the right-hand flue furnace is shown as normally fitted for hand firing. Both furnaces are supplied with the necessary air for the combustion of the required quantity of fuel by a motor driven f.d. fan with V-rope transmission.

Among other steam boiler developments represented the feed pumps displayed by G. & J. Weir, Ltd., are of particular interest. The pumps are mostly of the direct-acting type, the larger feed pump on show being a 6in by 8½in by 18in pump with a maximum capacity of 2,700 gal/hr. A direct-acting water service pump and a small vertical oil pump are also shown.

Boiler fittings displayed by Newman, Hender & Co., Ltd., include the "Newman-Bowler" bronze globe steam valve with a "controlled" ball clack and a reversible and renewable self-aligning seat ring; the "Newman-Milliken" glandless lubricated plug valve; and the "Newman-McEvoy" automatic self-sealing conduit gate valve.

Whether he is concerned with the treatment of water for steam boilers or for engine cooling systems there is much of interest for the generating engineer in the water treatment services of Houseman & Thompson, Ltd. The DM boiler solution combines scale prevention and the gradual removal of scale with a high oxygen absorption value and protective "sheen" properties.

Two new refractories are being displayed by the Morgan Crucible Co., Ltd. The new M.R.1 super-duty firebrick ensures longer life in those critical positions in furnaces, kilns, boilers, etc., where normal firebrick is liable to fail rapidly because of such factors as excessive temperature, slag attack and thermal spalling. The outstanding characteristics of M.I.28 are its very low weight and thermal conductivity for a brick of such high refractoriness. The density of the material is only 47·5 lb/cu ft, and in many cases the replacement of existing firebrick furnace walls by thinner walls in M.I.28 is possible, resulting in increased furnace floor area and greater output.

Boiler house auxiliaries are the keynote of the display by James Howden & Co., Ltd., the principal exhibits being forced and induced draught, primary and secondary air, axial flow and exhaust fans. These are manufactured for all types of steam raising plant from the largest power station to small single boiler installations.

A working model of the Howden-Ljungstrom rotary regenerative air preheater is being shown.

John Thompson (Wolverhampton), Ltd., is showing a pressed boiler drum end of 5ft 6in diameter and $3\frac{5}{32}$in thick, which will eventually form part of a steam drum for one of the six 540,000 lb/hr water tube boilers being installed at the B.E.A.'s Tilbury power station.

TURBINES

In the prime mover field a most interesting turbine exhibit by C. A. Parsons & Co., Ltd., is a completely bladed h.p. turbine shaft for a 60 MW, 3,000 r.p.m., three-cylinder turbo-alternator to operate with high steam conditions. The blading is arranged on a constant mean diameter necessitating only a single dummy to balance the steam thrust on the blades. The blades at the initial end are manufactured with integral roots and shrouds and for convenience of handling they are formed of short segments which are serrated along the root portion and secured in serrated grooves in the rotor by means of side locking strips.

An industrial gas turbo-alternator set by Ruston & Hornsby, Ltd., is being run on load to supply electricity for a considerable part of the lighting and power of the three main halls at Olympia. The turbine is of the type demonstrated recently to the technical Press (*Electrical Review*, 6th March). It is a lightweight adaptable industrial machine of 750 to 1,000 kW output.

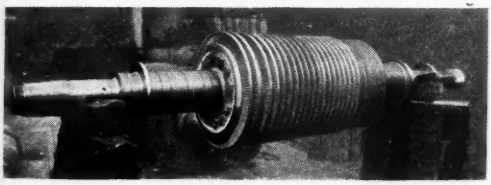
John Brown & Co. (Clydebank), Ltd., are showing a scale model of a 1,000 kW John Brown-Escher Wyss coal-fired gas turbo-alternator, with provision for waste heat utilization. Most of the units of this plant are nearing completion and it is soon to be erected for service in the company's gas turbine shop at Clydebank.

Models of turbine equipment displayed by Richardsons, Westgarth & Co., Ltd., include one of a Richardsons, Westgarth-Brown Boveri turbo-alternator, 30 MW, 22 kV, with condensing plant and auxiliaries, and one of a complete 7,500 s.h.p. geared turbine installation with boilers and auxiliaries.

An exhibit by the Metropolitan-Vickers Electrical Co., Ltd., is a steam turbine control desk for an 8,000 s.h.p. cargo vessel. This desk, which includes gauges, an automatic turning gear lever, ahead and astern valves, etc., is for use with one of the geared steam turbines made by the company for the cargo ships *Nestor* and *Neleus* of the Blue Funnel line (Alfred Holt & Co.).

Blackburn & General Aircraft, Ltd., are showing three models of the Blackburn-Turbomeca gas turbines which the company is now producing under licence in this country. The range of Turbomeca shaft turbines extends from 158 to 394 h.p., the basic design concept being retained in all engines, namely, single-stage centrifugal compression, a very compact annular combustion chamber and single- or multi-stage turbines. The shaft drive is either an extension of the compressor turbine shafting or is separate from it and driven by a free turbine. The annular combustion chamber, with rotating disc fuel distributor and burner, permits a very compact design. The three models on show are the "Palouste," the "Artouste" and the "Turmo"; the last two are suitable for driving electric generators.

C. A. Parsons h.p. shaft for 60,000 kW turbine



DIESELS

The most popular prime mover at the exhibition is the diesel engine. Many examples shown relate primarily to ship propulsion, but all are proven prime movers for electricity generation. A generating set displayed by John I. Thornycroft & Co., Ltd., has for its prime mover a six-cylinder 6in stroke diesel engine of the direct-injection type operating on the four-stroke cycle. The 12-hour continuous rating is 80 h.p. at 1,500 r.p.m. Starting is by means of an axial type 24 V motor, power for which is provided by two 12 V 78 Ah batteries and a 288 W 24 V dynamo. The 52 kW 400/230 V alternator is a G.E.C. rotating armature machine with a separate belt-driven exciter.

The largest exhibit on the stand of W. H. Allen, Sons & Co., Ltd., is a 500 kW diesel generating set, comprising a 6-cylinder, 333 r.p.m. engine directly coupled to a 588 kVA alternator. This type of set is constructed in three- to eight-cylinder sizes for outputs of from 218 to 750 kW. The type T47 engine is of the two-stroke airless-injection compression-ignition type, operating on the uniflow scavenge principle. The alternator is of the open, rotating-field, salient-pole type, generating at 415 V, and has an overload capacity of 10 per cent on a one-hour rating.

Among the interesting equipment shown by A.E.C., Ltd., is a 75 kVA diesel alternator set running at 1,500 r.p.m. The set is entirely self-contained ready for service and incorporates the A.E.C. 100 b.h.p. stationary diesel engine which is flexibly coupled to a MacFarlane 75 kVA 400/230 V, self-regulating "Magnicon" alternator, both units being mounted upon a common welded steel combination bedplate.

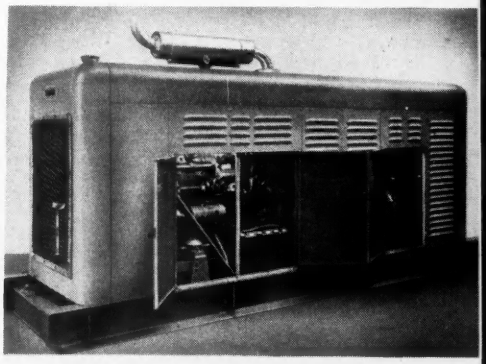
Included among a number of diesel engines on the stand of Henry Meadows, Ltd., is the 6DM970 "Nelson" engine, a compact six-

cylinder power unit of 15·9 litres capacity with a maximum continuous power rating of 145 s.h.p. at 1,500 r.p.m. and equipped with a Meadows type M.700 reverse/reduction gearbox which incorporates an oil cooler. Then there is the Meadows 75 kVA alternator set, powered by a 6DJ630 diesel industrial engine, which is compact and self-contained, yet easy to maintain and operate.

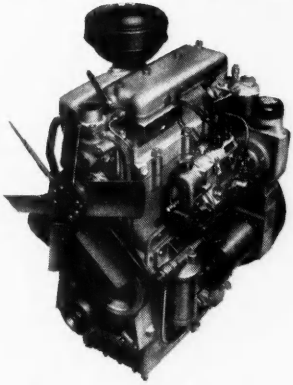
Diesel and petrol engine generating sets exhibited by the Coventry Victor Motor Co., Ltd., include the AD2 air-cooled diesel of 4 to 6 h.p. which is displayed in conjunction with a 3·5 kW 110/60 c/s generator, with press-button stop and start equipment.

A large eight-cylinder four-cycle turbo-supercharged diesel engine alternator set displayed by Harland & Wolff, Ltd., is one of several ordered by the British Electricity Authority for the Blackpool power station. It will develop 1,280 kW at 333 r.p.m.

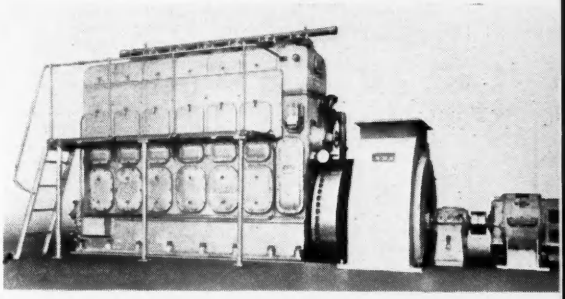
W. H. Dorman & Co., Ltd., also show a comprehensive range of diesel engines of from 20 h.p. to 160 h.p. for the industrial field and from



Thornycroft-G.E.C. 52 kW diesel alternator set

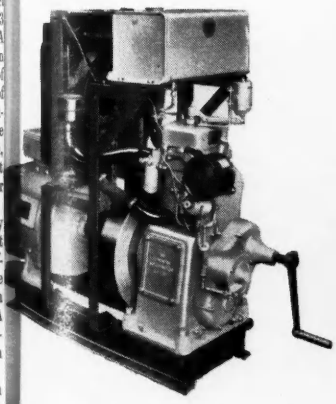


Dorman industrial diesel engine

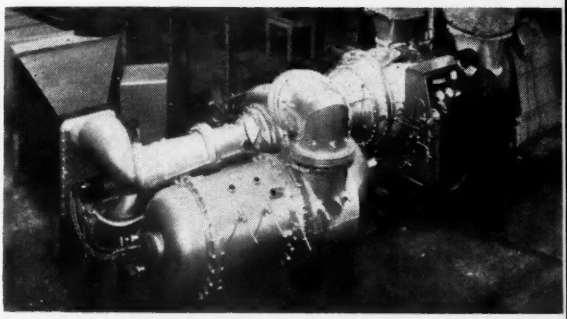


W. H. Allen 500 kW diesel alternator set

Ruston & Hornsby 1,000 kW gas turbo-alternator set



Coventry Victor diesel-electric generating set



35 h.p. to 100 h.p. for marine application. The 3LA three-cylinder 33/52 h.p. industrial engine is a new addition to the range. The 4DL.III four-cylinder 65/86 h.p. industrial engine is arranged in power pack form with all the accessories and ready to operate.

The 800 h.p. general purpose diesel engine shown by Crossley Brothers, Ltd., is a new scavenge pump diesel engine of "Vee" design and a direct-reversing equipment with twelve cylinders developing 800 h.p. at 1,000 r.p.m. The engine operates on the two-cycle port-controlled loop scavenge principle with exhaust pulse pressure charging.

The display of D. Napier & Son, Ltd., includes a Napier "Deltic 18" two-stroke opposed-piston diesel engine of 2,500 h.p. for a blast furnace turbo-blower, but, of course, it can also be used efficiently for electricity generation.

The main exhibits of Mawdsley's, Ltd., include a range of engine driven alternator sets of from 3 kVA to 200 kVA capacities, three-phase 1,500 r.p.m., the alternators being of the fully compensated type with the exception of the 3 kVA machine, which is of the single-phase rectifier compounded type.

A notable diesel engine display by the English Electric Co., Ltd., includes the 8RLD, an eight-cylinder dual fuel engine rated at 1,100 h.p. at 428 r.p.m. There are also a twelve-cylinder rail traction diesel engine and generator from the "SVT" range, with a maximum continuous rating of 1,500 h.p. and a speed range of from 420 to 850 r.p.m., and a six-cylinder diesel engine from the "RK" range, rated at 372 h.p. at 600 r.p.m.

A comprehensive range of diesel engine equipments being exhibited by Ailsa Craig, Ltd., includes 19, 26 and 40 kVA diesel engine driven alternator sets. The straight engine exhibits include a six-cylinder 60 h.p. 1,200 r.p.m. marine engine with a 2 to 1 reduction and giving a propeller shaft speed of 600 r.p.m., as well as a four-cylinder, 40 h.p., 1,200 r.p.m. industrial engine with radiator cooling.

Typical of the diesel-electric alternator sets being displayed by Russell Newbery & Co., Ltd., is the 50 kW set illustrated.

The D.P. Battery Co., Ltd., is displaying a comprehensive display of batteries specially designed for every type of industrial and marine duty. Most of the exhibits are built to the "Kathanode" design with "Porvic" separators. By virtue of their high capacity/weight ratio and length of life, batteries of these cells form eminently reliable and economical sources of power for traction duties.

SWITCHGEAR AND CABLES

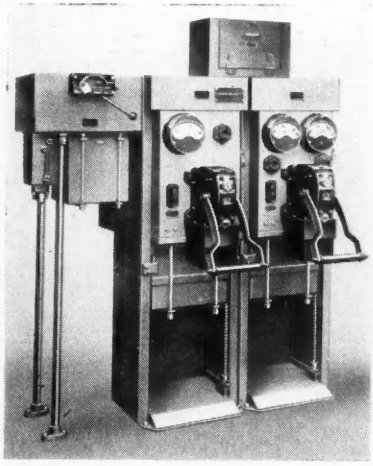
There is a fair representation of switchgear of all types in the Exhibition. A. Reyrolle & Co., Ltd., are showing a 33 kV vertically-isolated duplicate-busbar switchgear unit of the type described in the *Electrical Review* of 28th August, 1953. The switchgear panel has an oil-break circuit breaker with a current rating of 1,200 A and a rupturing capacity of 750 MVA. The compound-insulated busbars are of circular section and the current transformers, which are mounted over the earth-bands of stress-graded bushings, are air-insulated to facilitate their removal or replacement.

Of particular interest in a range of switchgear displayed by Erskine, Heap & Co., Ltd., are an 11 kV, 150 MVA rupturing capacity equipment and an 11 kV 250 MVA circuit breaker fitted with a patented arc control device. A 50 MVA 3·3 kV ring main equipment fitted with a wing isolator is also to be seen on this stand.

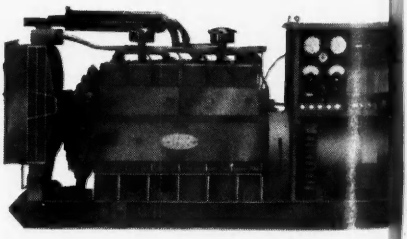
A 45 MVA 660 V class AJ21 air-break truck-type switchgear unit being shown on the stand of the British Thomson-Houston Co., Ltd., is of special interest because, although normally it is intended mainly for power station and industrial applications, it requires only small modifications to make it suitable for marine service.

Supporting the view that for some duties on

Erskine, Heap 50 MVA 3·3 kV ring-main isolator



Russell Newbery 50 kW diesel alternator



medium voltage circuits fuses are more suitable than circuit breakers is the exhibit by the Metropolitan-Vickers Electrical Co., Ltd., of metal-enclosed unit type distribution switchgear. Based on three sizes of fitted busbar chamber and five sizes of MC fuse-switch unit, such a switchboard can be readily built up, extended or modified from local stocks. The current ratings are 60 A (two-pole) and 60, 150, 300 and 500 A (three-pole), with high breaking capacity fuses of 250 MVA fault capacity at 400 V. The three-phase units can be arranged for use on either three- or four-wire systems.

There has been evolved a rather definite form of switchgear—mainly low and medium voltage—for the industrial field, and this fact is well marked on the stand of George Ellison, Ltd., where of special interest are a 660 V, 2,400 A, oil-break circuit breaker with slide rails for horizontal isolation, and a recently modified oil-cooled rotor starter for slip-ring induction motors.

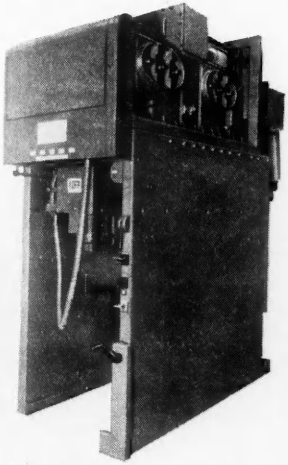
Among the very few electric cable exhibits is one by British Insulated Callender's Cables, Ltd., which is showing special types of cables for ship wiring; mass-impregnated non-draining cables; aluminium-sheathed wiring cables; aluminium-sheathed v.i.r. and p.v.c. insulated control cables; resilient moulded connector units; extensible t.r.s. flexibles; silicone-rubber-insulated cables; asbestos-insulated cables; and t.r.s. trailing cables including arc-welding flexibles.

A display by George Ellison, Ltd., includes four sizes of cable end couplings. These range from small ones suitable for lighting circuits up to heavy couplings for 6·6 kV power cables, similar to those in service with some of the world's largest excavators. The couplings provide a method of connecting cables on site without the use of solder, and no special tools are needed for their installation.

CONTROLS AND INSTRUMENTS

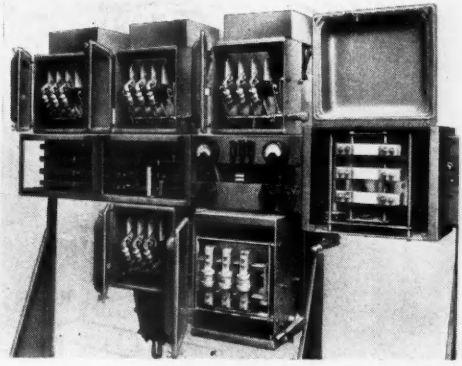
Control equipment, systems and instruments are naturally well represented in the Exhibition. Evidence of the growing importance of electronic control is to be found in the display of instruments by Dobbie, McInnes, Ltd. For instance, the Dobbie, McInnes-Ferranti high-speed recorder is a direct recording device which performs the complicated functions of a cathode-ray oscilloscope and a moving film camera. It provides direct and immediate records on electro-sensitive paper of low and high frequency variations from zero to beyond 2,000 c/s. The Ferranti fixed stylus method of recording has no inertia; hence there is no attenuation of the recorded signal with increase

Ellison rotor starter with new top protection



Reyrolle 33 kV vertically isolated switch unit

Below: **Metrovick fuse-switch distribution board**



in frequency and no variation in the phase relationship between the recording and the input signal at various frequencies.

A further contribution to electronic control is the new miniature recorder shown by Evershed & Vignoles, Ltd. This has been developed mainly for use with process control apparatus for recording physical and other quantities which are detected by various forms of electronic transmitters. It is a moving coil milliammeter with a small continuous roll chart having a 2in wide scale driven by a synchronous motor at a speed of 0·5 in/hr. The record is made by a high-speed tapping mechanism using an inked ribbon.

Items of industrial electronic equipment on show by the British Thomson-Houston Co., Ltd., include a high-speed batch counter for operation at speeds up to 24,000 counts a minute and an " Emotrol " equipment for the electronic control of a hosiery knitting machine drive.

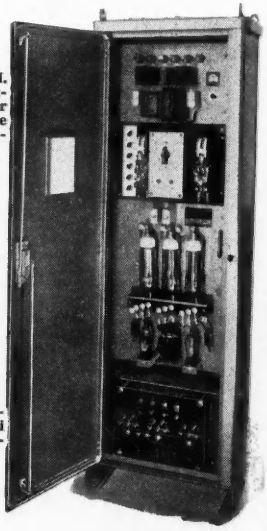
An outstanding feature of the exhibits of Cossor Radar, Ltd., is the MK 2A four-range Cossor marine radar equipment. This consists of the main rack which contains a transmitter-receiver and other electronic units, a display console, a scanner and a motor alternator driven from the ship's d.c. mains to provide power at 500 c/s for the other units. The operating frequency is approximately 10,000 Mc/s (X band) and the transmitter is a magnetron, pulse modulated by a delay-line type modulator to produce a pulse of radio frequency the peak power value of which is 22 kW.

Electronic equipment displayed by Decca Radar, Ltd., includes the company's latest marine radar sets which are fully operational and display a radar picture of the River Thames and the surrounding country transmitted by the Decca radar link to the roof of Olympia and thence to the stand. There are two marine radar sets which were introduced by the company at the Marine Exhibitions of 1949 and 1951 which have since been fitted to very many ships. Another interesting working exhibit is the recently developed direct plotting " Decca-plot " unit.

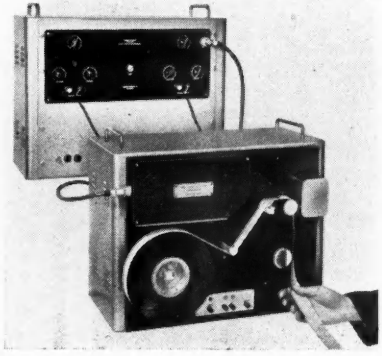
Of particular interest in connection with electronics and increasing productivity is the exhibit of the British Electrical Development Association. There is a model working layout of an industrial conveyor system for handling castings, electronic equipment providing for the counting and sorting of castings according to size or shape, and counting them singly or in batches. Other applications of electronics used in industry relate to colour comparison, counting, the operation of guards at dangerous parts of a press or other machine, and in connection with inspection and testing, for example by means of X-ray and gamma rays for the detection of hidden defects in welds, castings and assemblies.

Among the exhibits of Mullard, Ltd., are to be seen electronic process control equipment, including a temperature controller and a conductivity controller; an electronic speed stabilization invertor equipment; and ultrasonic equipment which includes a soldering iron.

In the examination of materials X-ray equipment is of outstanding importance. The Babcock & Wilcox research organization is represented in this field by exhibits illustrating development in the technique of weld testing. In addition to the normal X-ray methods applied during manufacture, other non-destructive methods applicable to site testing are shown, including magnetographic techniques; ultrasonic testing, where only one side of the object is available (as with butt welds in pipes);



Right: **B.T.H. Emotrol electronic motor control cubicle for hosiery knitting machine**



Left: **Dobbie McInnes - Ferranti high speed recorder**

and an ultrasonic "image" method in which a liquid suspension of metal particles by an ultrasonic beam shows the flaw pattern.

The new 150 kVp mobile unit shown by Solus-Schall, Ltd., is intended primarily for radiography on site of welded pipe lines, oil refinery towers and tanks, welded hulls, etc. It consists of two 75 kVp oil immersed transformers each incorporating a hot cathode valve and filament transformers, together with switchgear and a shockproof and ray-proof oil immersed X-ray tube with a cooling pump. All these parts are assembled on a trolley running on castors.

On view for the first time in Great Britain is the Newton Victor "Raymax 150" gas-insulated industrial X-ray equipment designed for operation at 150 kVp, 10 mA. The tube and transformer, which are assembled in a single, compact steel tubehead of very low weight, are insulated with sulphur-hexafluoride gas. The tube anode projects from the tubehead tank so that it can be introduced conveniently into hollow castings, pressure vessels, pipes, etc. The tubehead is mounted on a small gantry permitting a wide range of movement from which it can be quickly detached for on-site radiography. The control box is exceptionally robust.

As an example of the "straight" electrical type of controls, the display by Erskine, Heap & Co., Ltd., includes a comprehensive range of air break motor starters for both hand operation and push-button control, and oil immersed motor control gear of the star-delta, stator and rotor, and auto-transformer types. Knife switches, fuses, isolating switches, ammeters and voltmeters, and all accessories required on switchboards such as indicating lamps are also displayed. A No. 2 size motor operated liquid starter is also being exhibited, as well as d.c. circuit breakers, panel mounting oil-break breakers and flameproof Buxton-tested switchgear and motor control gear.

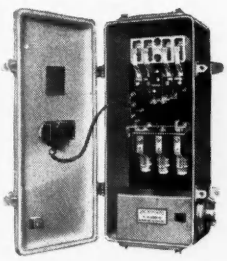
Among a comprehensive range of motor starting equipment displayed by Brookhirst Switchgear, Ltd., is a selection of "simple range" starters which comprise a.c. and d.c. starters of nearly all types and sizes and includes equipments for hand and automatic operation, for wall and floor mounting, and for local or remote control. Adaptability is the keynote of these designs, provision being made for the inclusion of many extra features to meet specific requirements, which are not usually available in standard equipments.

A special item in the display by the Electric Construction Co., Ltd., is a control scheme for a diesel driven 5 kVA "continuity" alternator set with the company's "no-break" feature designed for telecommunications and other essential services. This equipment is complete with demonstration control gear and is connected to a teleprinter lent by the G.P.O. to demonstrate how the set continues to maintain supplies when the mains are broken.

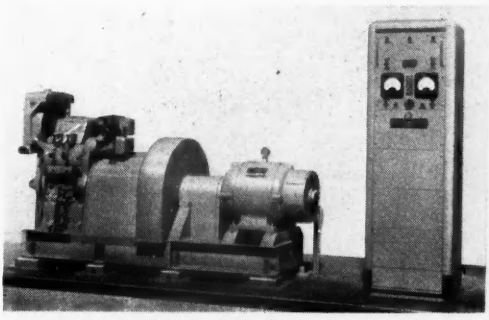
The "RM" pneumatic pressure switch for controlling electrically-driven air compressors is shown by Reavell & Co., Ltd. This has been designed to provide a simple and inexpensive means of automatically starting and stopping electrically-driven air compressors, according to the variations of pressure in the air receiver. As the pressures for stopping and starting are adjusted separately, the range is independent of the working pressure, so that any desired range may be obtained down to the minimum for which the particular type of switch is suitable. Adjustment is very simple and once the limits have been set, they will not vary.

Mobrey magnetic level switches which initiate high or low level alarms in storage vessels and control electrically driven pumps may be seen on the stand of Ronald Trist & Co., Ltd. These switches are entirely glandless in construction and operate magnetically through the wall of the switch flange.

The electro-dynamic balancing machine displayed by W. & T. Avery, Ltd., is designed for determining the amount of unbalance in a rotating body and automatically indicating its position. The time required to determine the



Brookhirst 7·5 h.p. 400/440 V basic straight-on marine starter



E.C.C. "continuity" diesel alternator with "no-break" feature

amount of unbalance is negligible, and the "floor to floor" balancing of a rotor is rapid and simple. The machine indicates either the amount of correction necessary at two pre-selected positions in each of two planes or the actual amount and position of unbalance in each plane (two-point and single-point correction).

Instruments are closely allied to, and indeed are often an essential part of controls. A feature of a contents controller shown by K.D.G. Instruments, Ltd., is the fact that it is based on the company's continuous reading tank contents gauge. The controller unit is completely independent of the dial. New pressure, differential and liquid level switches cover, in various models, from 0·1in of water up to 6,000 lb/sq in.

Honeywell-Brown, Ltd., are exhibiting a comprehensive range of instruments designed to meet the increasing demands for closer industrial process control. In addition to the well-known Brown "Electronik" potentiometers and "Protectoglo" combustion safeguard systems, certain newly-developed instruments include the Honeywell electronic modulating control, the Brown differential convertor, diaphragm type pneumatic flow transmitters and associated conventional and miniature receivers.

Outstanding among a range of dial thermometers, recorders and controllers, displayed by the British Rototherm Co., Ltd., is a new indicator control thermometer with adjustable electrical contacts. It is fitted to a mercury-in-steel distant reading thermometer, but it can also be used with bi-metal and vapour pressure thermometers. The unit consists of one pointer fitted with the contact, which is adjustable over the entire scale, and another pointer fitted with temperature-actuated contacts. The contacts are of pure silver, providing positive action during making and breaking.

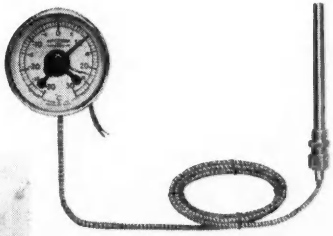
The replacement of the generator by a static rectifier in the "Megger" insulation tester is the feature of the new 5,000 V mains-operated instrument exhibited by Evershed & Vignoles, Ltd. The rectifier is operated from a.c. mains in conjunction with a step-up transformer. Three testing voltages are available, namely, 1,000, 2,500 and 5,000 V, the required voltage being selected by a switch on top of the instrument.

Among the new electrical instruments being displayed by Crompton Parkinson, Ltd., are 4in and 6in dial short scale types in pressed steel cases.

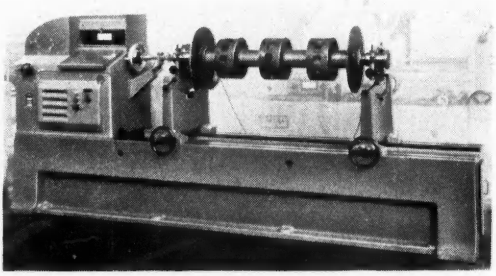
Two rather unusual instruments are included in the display by Cathodic Corrosion Control, Ltd. One is a "corrosion voltmeter" which is specially designed for measuring corrosion potentials in the field or laboratory. This instrument has been developed in conjunction with the Cambridge Instrument Co., Ltd., who are the manufacturers; it can be used either as a high resistance d.c. voltmeter or as a potentiometer for voltage measurements in circuits of extremely high resistance. The other instrument is a "Holiday" detector for indicating flaws in protective coatings on pipelines, etc.

Ships' instruments displayed by S. G. Brown, Ltd., include gyroscopic compasses and automatic helmsmen for ships' navigation. The Type "A," "A.1" and "A.2" gyro-compass equipments for operating bearing and steering repeaters, course recorders and automatic helmsmen, are now fitted with a new type of electronic repeater system.

A comprehensive range of measuring and indicating instruments is displayed by Smiths Industrial Instruments, Ltd. The company's "Desynn" system incorporated in the rudder angle or variable pitch propeller indicators enables instantaneous and accurate following of rudder movements or pitch variations when variable pitch propellers are fitted. For checking revolution speeds of all types of machinery instantly there is the company's hand tachometer which also permits records and comparisons to be made by retaining the



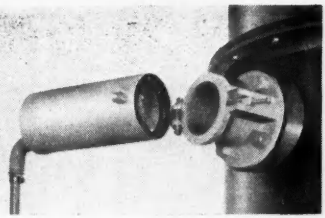
Rototherm indicator control thermometer with adjustable electrical contacts



Left: **Avery dynamic balancing machine for rotors up to 600 lb**

pointer before withdrawal from the drive. The accurate data revealed by the precision hand tachometers incorporating the magnetic principle assist time and motion study.

The "Electricon" smoke density indicator of Ronald Trist & Co., Ltd., is designed to observe photo-electrically the smoke passing through chimneys or ducts and to give an alarm when it becomes excessive, thus permitting a more precise control of combustion.



Trist "Electricon" smoke density indicator

Smiths hand tachometer

TRANSFORMERS

In the display by C. A. Parsons & Co., Ltd., the main exhibits include a model of a 120 MVA, three-phase, 50 c/s star-connected auto-transformer for use at the points of interconnection between the 275 kV and 132 kV systems of the British Electricity Authority. A lower voltage tertiary winding is incorporated in the design and the common neutral point of the transformer is solidly earthed. A tapping range of ± 15 per cent in eighteen steps in the main 132 kV common winding is provided, the tap changing equipment being arranged for on-load variation. The 275 kV bushings are of the re-entrant condenser type which allows a convenient connection to be made to the top of the e.h.v. winding.

An impressive Metrovick exhibit is a model of a 120 MVA 132/275 kV transformer with on-load tap changing, eight of which are to be supplied for the B.E.A. super grid. These equipments are three-phase star-connected auto-transformers with tappings at the 132 kV line point covering a range of 30 per cent in eighteen steps. The tappings are connected to three single-phase on-load type H tap changers.

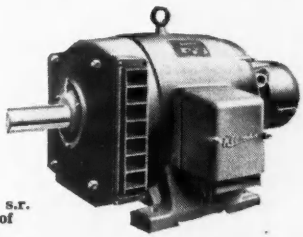
In addition to the individual displays of the companies of the Lancashire Dynamo Group, of outstanding interest is a composite working exhibit demonstrating the comprehensive engineering service of the Group. This exhibit includes a Foster voltage regulating transformer delivering three-phase power at a voltage adjustable over a wide range to a Nevelin six-phase single anode grid controlled rectifier. The d.c. output voltage is automatically stabilized at a pre-set value by a magnetic servo control. The rectifier is arranged to supply two d.c. adjustable speed Lancashire Dynamo & Crypto motors specially designed to operate in approximate synchronism even when their loads differ considerably.

ELECTRIC MOTORS

One of two a.c. motors being shown by W. H. Allen, Sons & Co., Ltd., is a vertical-spindle, drip-proof, two-bearing, 125 h.p. synchronous, induction type machine for driving an Allen dock pump. The fabricated motor frame has a flange at the driving end for direct mounting on the pump. The laminated stator and rotor cores have semi-closed slots carrying Class A insulated bar windings, and the rotor slots are skewed to reduce noise and provide smooth acceleration. A radial fan is fitted at the non-driving end, and the motor is started as a normal slipring machine, using a stator/rotor starter, and when the motor is up to speed the starter is cut out, the exciter is energized and the motor pulls into synchronism. The power factor may then be adjusted to the required value by the exciter shunt regulator.

Exhibits from the wide range of B.T.H. electric motors available include a number of totally-enclosed fan-cooled British Standard dimension motors which are now in full production. They are built to conform with B.S. Draft Specification CN. (ELE) 6814 and cover a range of three-phase, 50 c/s, s.c. machines up to 20 h.p. at 4-pole speeds, with corresponding ratings at other speeds.

A comprehensive range of electric motors is shown by Newman Industries, Ltd. The totally enclosed motor to the draft British Standard dimensions is represented by sizes up to 25 h.p. A recent addition is the "Industrial" type



Newman s.r. drip-proof motor

motor with outputs of from 20 h.p. to 200 h.p. These motors are made in s.r. or s.c. types and are supplied with drip-proof enclosures. The shafts are exceptionally robust and the bearings, ball and roller, are of such dimensions that they ensure long service. With the exception of the largest frame size, all these motors comply with N.E.M.A. dimensions.

The exhibit by Crompton Parkinson, Ltd., emphasizes the development of equipment of standard dimensions to provide interchangeability with similar products of several manufacturers. The range of s.c. motors of standard dimensions is from 0·5 h.p. at 750 r.p.m. to 25 h.p. at up to 3,000 r.p.m.

The English Electric Co.'s exhibit embraces three types of industrial motors, namely, examples from the LY, the XLK and the KKS ranges. Motors in the first class comply with the new B.S. draft specification CN. (ELE) 6814 for totally-enclosed fan-cooled s.c. motors. The XLK motors are of the flameproof, fan-cooled type, covered by Buxton certificates for groups 1, 2 and 3 gases; and the KKS a.c. motors are for cranes, hoists and lifts.

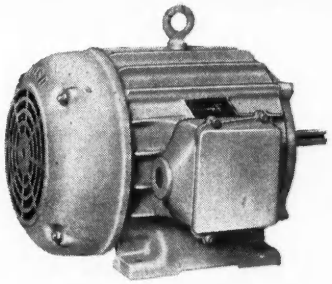
The motors and allied equipment shown by the Electro Dynamic Construction Co., Ltd., comprise marine electrical power equipment, including vertical and horizontal motors to Lloyd's specification; variable speed a.c. commutator motors; Ward-Leonard sets; and a high frequency motor alternator for marine and general use.

Among the motors shown by the Electrical Power Engineering Co. (Birmingham), Ltd., there are naturally and fan cooled s.c. flameproof Buxton certified motors in sizes of 3 to 12·5 h.p., including motors flange mounted to reduction gears. There are also single-phase repulsion induction motors, including 0·5 h.p. and 0·75 h.p. models with integral switches for petrol pumps; and a 7 h.p. electric vehicle d.c. motor and a standard 10 h.p. industrial motor.

The motor exhibits of Mawdsley's, Ltd., include a range of dual fan cooled a.c. motors, a capstan motor with a disc brake, and a sectional arrangement of an axial flow d.c. motor for ship ventilation, operating in its trunking.

To show the wide range of applications covered by their standard machines, Laurence, Scott & Electromotors, Ltd., are exhibiting scale models of more than 50 a.c. and d.c. motors. These embrace s.c., "Trislot" high torque and s.r. industrial motors in various enclosures, including the "Emcol" totally enclosed fan cooled, British Standard dimension, flameproof, crane, and N-S variable speed a.c. machines. The d.c. exhibits include a comparable range of industrial and marine type motors. There is also a working model of a Scott "Selector" winch, in which both the physical characteristics and the electrical performance are represented to scale.

Small Electric Motors, Ltd., show examples of industrial s.c. motors built to relative British



C.P. "Klosd" s.c. motor of standardized dimensions

Standard Specifications, with drip-proof covers, from 0·05 to 2 h.p. single-phase, and 0·5 to 10 h.p. three-phase. Single- and three-phase 60 c/s motors built to Canadian Standards Association requirements are also shown, as are sectioned motors showing the bearings and method of lubrication, centrifugal switch operation and general construction.

One Metrovick exhibit is a model of a 40,000 kVA synchronous condenser. The actual machine is the largest yet built in Great Britain and has recently been shipped to Australia for installation by the State Electricity Commission of Victoria, at the Malvern power station, Melbourne. Although the rotor alone weighs 61 tons, the whole machine can be erected or dismantled by using only a 3-ton mobile crane. The condenser is designed for mounting on a concrete plinth, so that no basement is required, and built-in gear is provided so that the stator and rotor can be removed on rollers by the use of jacks.

INSULATING MATERIALS

Electrical insulation and allied materials and products are included in the display by the Micanite & Insulators Co., Ltd. Mica exhibits include the raw material, block and splittings; examples of fabricated mica such as condenser films, discs, plates, washers, commutator separators and formers, and electric iron and kettle element formers. Micanite sheet materials include commutator and moulding micanite, flexible micanite, thermosetting flexible micanite, mica tapes, brown and black micafolium high heat micanite, and heat resisting micanite. There is also a complete range of samples of "Empire" varnished cloths, silks, woven glass, Terylene and papers.

The many uses of plastics in the electrical and allied industries are indicated by the exhibits of Tufnol, Ltd., which include specimens of Tufnol in sheet, tube and rod forms and a selection of engineering and marine components produced from these basic shapes with the usual engineering tools.

The use of glass for electrical insulators is depicted on the stand of Pilkington Brothers, Ltd., by a section of transmission line carried by "Armourlight" toughened high-voltage glass insulators.

Electrical engineers concerned with insulation problems will be interested in some of the plastics exhibits by Imperial Chemical Industries, Ltd. There are nylon mouldings and industrial brushes, as well as "Alkathene" tube and film, moulded components, and engineering components moulded in "Fluon" (polytetrafluoroethylene).

Among the exhibits of Doulton & Co., Ltd., are low-resistant porous ceramic diaphragms for use in electrolytic processes, as well as the Doulton dechromator, which is designed to increase the efficiency of electroplating processes by overcoming excessive reduction of the solution during working. The unit consists of a porous pot containing uniformly-spaced cathodes, and a close-fitting hook which serves as a connection to the cathode bar of the bath.

POWER TRANSMISSION

Among the heavier types of power transmission equipment such as are used in generating plants are the Allen-Stoeckicht epicyclic gears shown by W. H. Allen, Sons & Co., Ltd. Applications for which these double-helical gears are particularly suitable are gas and steam turbines. The exhibits include a complete double-reduction, double-helical, epicyclic gear for a 650 h.p., 16,500/600 r.p.m. steam turbo-generator, with the top half of the cover removed to show the arrangement. The unit consists of two epicyclic reduction trains in series, the first train being a star gear and the second a planetary gear.

Two of the David Brown Corporation's exhibits are railcar gearboxes in sectional form. The larger of these hypoid gear units is of the type which is being supplied to the Toronto Transport Commission. Weighing just over 10 cwt, the unit has a fabricated steel case, and the transmission ratio is 7 to 52, the wheel having a pitch circle diameter of 20in. The unit is suitable for drives transmitting a 2,500 lq tractive effort and is designed for use with a 65 h.p. motor, giving a maximum speed of 55 m.p.h.

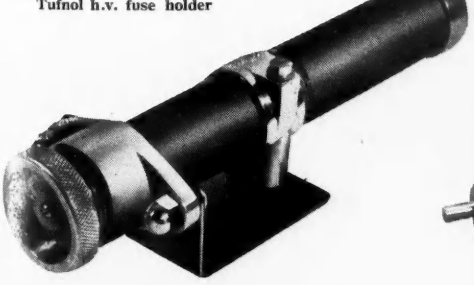
The automatic centrifugal clutch coupling exhibited by Thomas Broadbent & Sons, Ltd., provides smooth, shock-proof transmission. The working parts are confined to a driven half and a driving half carrying four loose shoes lined with "Ferodo" on the outer face. As the motor speed increases, centrifugal force throws the shoes radially outward, and they engage the driven half, gradually accelerating it to full motor speed. All starting difficulties are thus overcome and it is also an effective safeguard against overloads, for the weight of the shoes limits the torque transmitted.

Among the fluid couplings displayed by the Fluidrive Engineering Co., Ltd., are both static and working models. In the former is a range of standard runners from the size 6, which transmits from 0·1 h.p. at 1,000 r.p.m., to the size 46 which transmits 2,500 h.p. at 800 r.p.m. Standard traction and scoop-control fluid couplings are also shown, as are also the size 46 SCR8 coupling as used for marine propulsion, and size 20 ST9, rated at 1,500 h.p. at 2,950 r.p.m., for the driving of boiler feed pumps, compressors, etc.

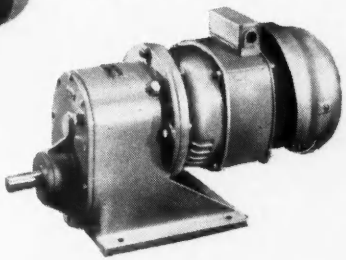
The Dunlop Rubber Co., Ltd., shows moving V-belts; a disc coupling model in the complete range of eight sizes; a barrel coupling demonstration model; a range of anti-vibration mountings; as well as special hoses and two large processing vessels of intricate design, each lined with a different type of material.

For use for all forms of industrial power transmission and for particular application in drives from high speed or low speed electric motors and in the driving of generators from other forms of prime mover, the Morse Chain Co., Ltd., is exhibiting its inverted tooth type chain and chain drive, a new round pin roller chain of enhanced strength, together with sprockets for operation therewith, a flexible chain coupling in both bush roller and inverted tooth types and an indexing and over-running clutch.

Tufnol h.v. fuse holder



S. E. Opperman geared motor unit with Lancashire motor



A power transmission display by Opperman Gears, Ltd., includes a range of "Oppigear" products comprising single-, double- and triple-reduction helical and spur geared motors. These can be arranged for floor, vertical, wall or ceiling mounting and are capable of transmitting between 0·125 and 20 h.p. with output speeds between 11 and 377 r.p.m. These speed reducers can be fitted with any make of electric motor having any type of enclosure, and the complete equipment forms a strong one-piece unit which is installed in exactly the same way as an electric motor.

Among their speed reduction gear units for coupling to electric motors Schofield & Samson, Ltd., are making a special feature of the new "Convecool" unit. The method employed for cooling this is by air convection tubes which run through the sump of the box.

Power transmission equipments exhibited by S. E. Opperman, Ltd., include worm reduction units of single and double reduction types. Single right-angle types range from 0·05 to 20 h.p., and there are double reduction horizontal right-angle gears with vertical or straight through outputs.

A wide display of power transmission schemes by Alfred Wiseman & Co., Ltd., includes a geared motor unit which has been specially designed to suit the new British Standard range of totally enclosed, fan-cooled, flange mounted motors of the frame size range B.183D to B.326D (from 0·75 to 25 h.p.).

Flexible shaft transmission is exemplified on the stand of Brooks & Walker, Ltd. The "Derota" high-speed precision flexible shaft workshop unit has been primarily designed for the delicate machining operations carried out by toolmakers, modelmakers, jewellers, and the like. It comprises a high-speed universal electric motor, a stainless steel braided flexible shaft, a six-speed foot control and a straight hand-piece fitted with ball bearings.

Power transmission exhibits by Small & Parkes, Ltd., include "Don" brake and clutch fabrics and "Don-Flex" clutch discs for industrial purposes on brakes, clutches and friction drives, etc., and grooved "Roko" belting in which the "pile" driving surface grips, the grooves effectively overcome air traps, and the solid weave and "non-fray" edges make it suitable for difficult drives and "shock" loads.

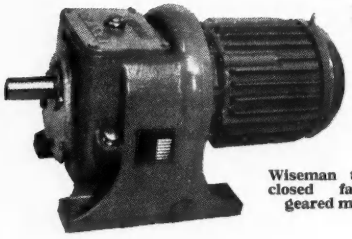
A Lockheed central control cabinet which is being displayed by Automotive Products Co., Ltd., has a motor driven pump, while a panel mounted metering and reversing valve directs the resulting fluid flow to give power operation. Manual hydraulic control is also provided and auto-change-over valves make either power or manual control immediately available at will.

CENTRIFUGES

Of particular interest on the stand of Thomas Broadbent & Sons, Ltd., is the new sugar centrifuge in which the high-duty forced-ventilated motor is built directly on to the main spindle without an intermediate flexible coupling. Highly efficient braking which gives reduced time cycles is electrodynamic from full to half speed. Control is initiated by a process timer and air operated mechanical braking is then automatically applied to stop the machine. Finger-tip control gives easier, faster and smoother feed through a power-operated gate type valve specially designed to prevent sticking, and emergency hand gear is fitted to close the valve in the event of a power failure.

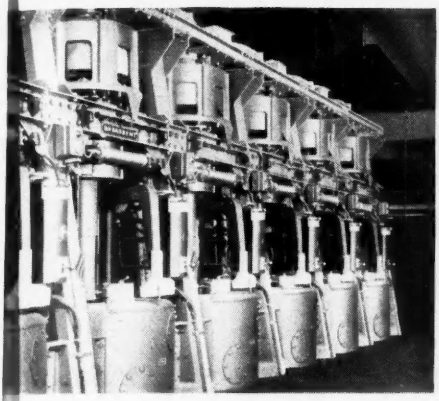
Among the exhibits of the Alfa-Laval Co., Ltd., are De Laval centrifugal separators of special design for the purification of turbine lubricating oil. The Type 4024 PSE machine has a throughput capacity of up to 250 gall hr and it includes an indirect electric oil heater with automatic features.

Included in the display of Sharples Centrifuges, Ltd., are laboratory super-centrifuges which have been extensively adopted as standard equipment for research and industrial laboratories. Two types of the open model are

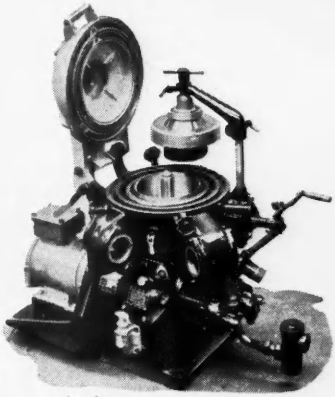


Wiseman totally enclosed fan cooled geared motor unit

Right: Lockheed centralized control cabinet



Battery of Broadbent sugar centrifuges



De Laval turbine oil purifier

shown, one with an electric drive and the other turbine driven and suitable for either steam or compressed air driving. The motor driven machine operates at 23,000 r.p.m., generating a centrifugal force of over 13,000 times that of gravity, while turbine driven machines run at speeds up to 50,000 r.p.m.

AIR COMPRESSORS

The almost universal adoption of the electric drive for air compressors has resulted in compressed air operation in the mine, steelworks and general factory being regarded nowadays as an electrical application. The 4in stroke air compressors displayed by Williams & James (Engineers), Ltd., are available in units comprising one, two or four cylinders, single stage; and two or four cylinders, two stage. The maximum pressure for the air-cooled single stage models is 80 lb/sq in; for the water-cooled single stage models it is 125 lb/sq in; and for the water-cooled two stage models 450 lb/sq in.

Air compressors included in the display of Reavell & Co., Ltd., include a 1,000 cu ft/min two stage, double acting, vertical compressor for pressures up to 120 lb/sq in; an example of the Reavell quadruplex compressor with a capacity of about 250 cu ft/min at up to 120 lb/sq in; and four sizes of single stage, single acting, vertical compressors, including single crank machines of 17 and 39 cu ft/min and two crank machines of 82 and 155 cu ft/min; and a two stage compressor for 100 lb/sq in with a capacity of 300 cu ft/min.

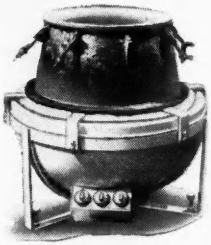
INDUSTRIAL HEATING

There is ample evidence at the Exhibition of the considerable modern development of industrial heating, particularly in respect of self-contained electrically heated vessels for the chemical industry. The Thermal Syndicate, Ltd., is displaying a range of "Vitreosil" acid-proof immersion heaters for heating acid liquors in pickling tanks and electroplating baths. These units are completely sealed and are unaffected by all acids except hydrofluoric and glacial phosphorics. The heaters are protected electrically by a new internal earth wire and they are available in 0·25 to 5 kW models in standard sizes.

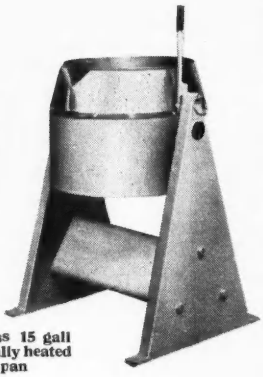
Electrothermal Engineering, Ltd., shows electric heating equipment for vessels of all shapes and sizes, pans and fractionating columns, and for the conversion of steam heated chemical plant to electric heating. There are also flexible and elastic heating tapes for temperatures up to more than 400 deg C, as well as flexible armoured heaters for temperatures up to 800 deg C for use on metal tubes, cylinders, pipes, catalyst tubes, etc.

For reaction and distillation work outside the temperature range in which steam heating is effective, a series of electrically heated units is produced by Quickfit & Quartz, Ltd., and one such plant, fitted with the recently developed gas-purged heating mantle, is on show on the company's stand. This plant provides for reaction under total reflux, with stirring, gas-bleed and temperature measurement, followed by distillation under atmospheric or reduced pressure, and the heating equipment is temperature-controlled and nitrogen-purged.

One of the contributions to the field of industrial electric heating by Isopad, Ltd., is the "Isomantle" equipment for use with a 20 gallon enamelled c.i. sulphonating pot. It has a loading of 4 kW and is arranged for three-heat switching. Another of these exhibits is the "Isodrum" heater for drums of 40 to 55 gallons capacity. Loaded at 4 kW, this electric drum heater is made in two hinged sections which are mounted on ball castors, so that the



Four kW "Isomantle" supporting 20 gall sulphonating pot



Taylor Rustless 15 gall 4·5 kW electrically heated jacketed pan

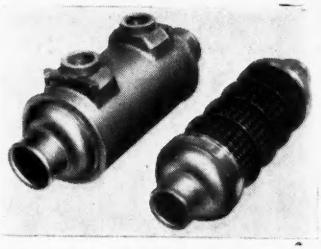
heater can easily be placed around the drum.

Among a range of electrically heated and jacketed pans being displayed by the Taylor Rustless Fittings Co., Ltd., is a 15 gallon pan fitted with a 4·5 kW jacket by the Stabilag Co., Ltd. The company is also developing a jacketed pan in which the steam is raised by means of electric heaters within the jacket.

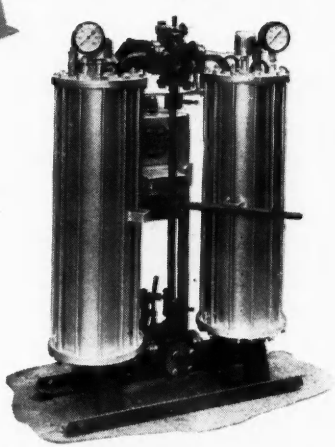
In the display of the Stabilag Co., Ltd., is a wide range of moulded and uniformly heated high and low temperature electric jackets and control equipment, covering many laboratory and industrial applications. Among these are a synthetic resin pilot plant; a rubber-lined rectangular tank with a heater as a lamination, for heating low temperature corrosive materials; and a range of laboratory scale heating jackets, complete with temperature control equipment and distillation glassware.

An electrically heated white metal pot is an exhibit of the Hoyt Metal Co., of Great Britain, Ltd. The heating is by three identical elements wound on the exterior of the melting pot. The large area covered ensures consistent heating and the elements have a long life. Provision is made for automatic temperature control within the range of 212 to 932 deg F capable of instant adjustment to any pre-determined temperature. An automatic time switch can be incorporated.

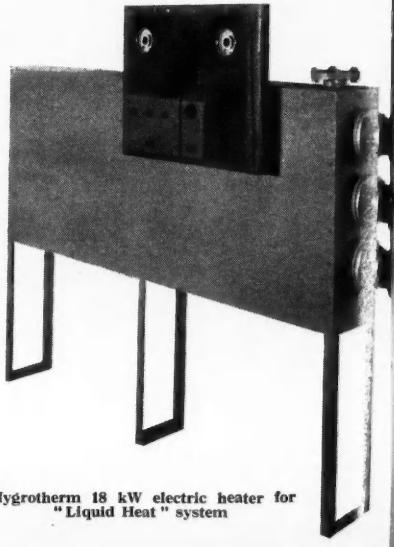
Exhibits of Barlow-Whitney, Ltd., include a compact self-contained humidity test cabinet specially developed for testing electrical equipments in accordance with Service specifications; a medium size tinning bath suitable for temperatures up to 600 deg C; a 500 lb white metal melting pot suitable for lead, babbitt, tin and stereo metal, etc., for use in engineering shops, battery works, the electrical trades, etc.; a medium size electrically heated hot oil circulator operating at temperatures up to 500 deg F which can be installed adjacent to the process equipment; and electric muffle furnaces for the workshop or laboratory which operate at temperatures up to 1,000 deg C.



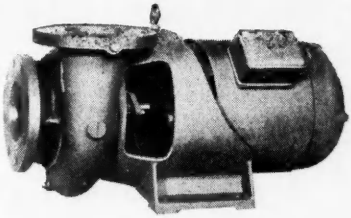
Serck guided-flow water-cooled oil cooler



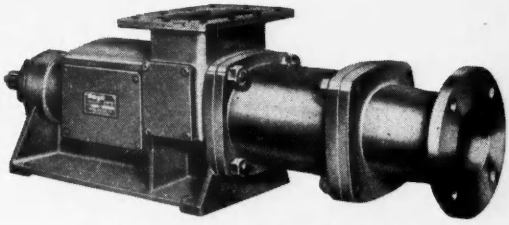
Birlec "Lectrodryer" for humidity control



Hygrotherm 18 kW electric heater for "Liquid Heat" system



Girdlestone 4in centrifugal motor pump



Mono pump for handling dry materials

The exhibits by Serck Radiators, Ltd., include heat exchangers and water and oil coolers for all kinds of plant including turbo-alternators and electric transformers. Two kinds of combined unit are exhibited, each comprising an oil cooler and a jacket water cooler incorporated in a header tank. They are very compact units designed for mounting on the engine. A new lightweight guided-flow water-cooled oil cooler also on show is designed for inclusion in the water jacket circuit of industrial engines of up to 150 h.p., and it acts as a heat exchanger between the oil and water circuits.

Among high frequency and dielectric heating equipment shown by Redifon, Ltd., are new 25 kW, 8 kW and 3 kW induction generators, and a new J.P.G. plastics welder for packaging.

Demonstrating the adaptability of their standard chemical industry products James A. Jobling & Co., Ltd., are showing a climbing film evaporator. A glass covered electric immersion heater is the basis of a water still which is capable of producing pyrogen free water.

"Lectrodryer" units for the humidity control of process gas flows and the conditioning of enclosed spaces are exhibited by Birlec, Ltd. Small "Lectrodryers" are being installed in power stations to dry alternator cooling hydrogen.

"Liquid Heat" is a heat transfer medium which remains in the liquid state without pressure within a temperature range of from nil to 600 deg F. It is being exhibited by Hygrotherm Engineering, Ltd. From the electrical point of view the equipment contains certain novel features to ensure that the liquid is not in any way overheated while passing through the heater unit. The company uses a 2in tubular type of immersion heater of standard rating, the heater elements being contained within a tube of larger diameter and arranged with a certain amount of dead length, so that the liquid is heated only when it is passing over the elements at a controlled flow rate.

The "Cascade" cooler being exhibited by British Acheson Electrodes, Ltd., consists of thirteen sections of "Karbate" pipe in 9ft lengths mounted vertically on block ends. This is a suitable equipment for cooling liquors or for use as an absorber.

In the industrial heating field the Electronics Department of the English Electric Co., Ltd., is represented by a new design of h.f. induction heater.

MATERIALS HANDLING

Materials handling equipment by International Combustion, Ltd., is represented by a working model of a gravity bucket conveyor system which includes Beaumont skip hoists and drag scrapers, belt conveyors, ash handling plant and samplers, while on the same stand the Riley Stoker Co., Ltd., is exhibiting a working arrangement of "Syntron" electric vibratory equipment.

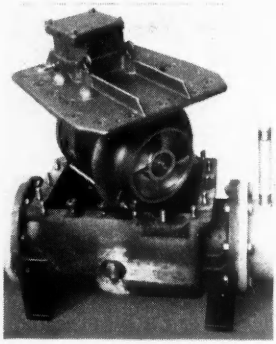
Of particular interest in the same field is a working model of a handling plant for washery slurries exhibited by Babcock & Wilcox, Ltd. Another interesting Babcock exhibit is an oil-filled idler pulley for belt conveyors. This requires no routine greasing which enables conveyor plants with greatly reduced maintenance requirements to be built.

A special overload feature incorporated in the ratchet hoist made by Felco Hoists, Ltd., takes the form of a friction clutch which, in the event of excessive overload, will slip, making the lifting operation impossible, while at the same time it will sustain the load.

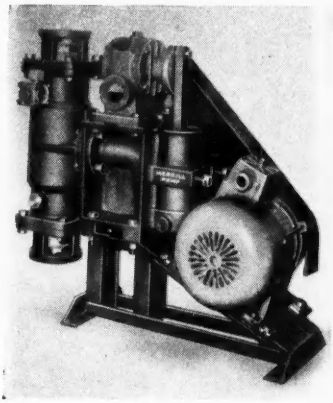
Pumps also come within the scope of materials handling, and perhaps the outstanding exhibit on the stand of Mono Pumps, Ltd., is the DM12 pump for handling powdered dry materials. Its ability is demonstrated by drawing powder from a hopper and lifting the material back to the hopper.

Pumps for the chemical industry being shown by L. A. Mitchell, Ltd., include a motor driven diaphragm acid pump. This self-priming unit can be mounted on a trolley for portability; it has a capacity of 600 gall/hr with a total head of 30ft and a suction lift of 10ft.

Among a wide range of pump exhibits by Girdlestone Pumps, Ltd., are single stage, axial entry, radial delivery pumps in which the shaft runs in two externally housed deep groove ball bearings, the design eliminating the necessity for a neck bush bearing in the pump casing. For the circulation of hot water in central heating systems, a range of centrifugal pumps is on show fitted with special impellers and



Right: **Merrill tube diaphragm chemical pump**



Left: **Drysdale "Capsule" transformer oil pump**

V-belt transmission for speeds from 600 to 960 r.p.m., transmitted from resiliently mounted f.h.p. motors. These units are designed for low head operation with outputs varying from 10 to 200 gall/min.

Among the pumps and allied equipment displayed by Gwynnes Pumps, Ltd., is a large impeller for one of the 45in centrifugal circulating water pumps which are being supplied to the British Electricity Authority, each pump being capable of a duty of 45,000 gall/min against a total head of 60ft.

The display by Drysdale & Co., Ltd., embraces pumps for use in every branch of engineering. The self-priming rotary "Centrex" pump is for handling water with a mixture of air, such as in bilge pumping, etc. The air is separated from the water and pumped by means of a water ring air pump, the water being handled by a centrifugal pump. A Drysdale axial flow type "Capsule" pump for the circulation of transformer oil has suction and discharge branches in the line, and the motor, which is fixed to the pump cover, runs in the oil being pumped, the impeller being attached to an extension of the motor spindle. By closing the suction and discharge valves the entire pump and motor unit can be removed without loss or drainage of oil.

A special-purpose pump displayed by Mirrlees (Engineers), Ltd., is the Mirrlees "Imo" oil pump which is used extensively by many electrical engineering manufacturers in this country for forced lubrication of alternators and generators and for the governing of water turbine sets.

An exhibit of British Acheson Electrodes, Ltd., is a pump having a "Karbate" body mounted on a stainless steel shaft. A unique mechanical seal is embodied in the pump and the liquor is in contact throughout with "Karbate" only. The pump is available in capacities of from 50 to 400 gall/min, with heads up to 100ft.

On the stand of Sigmund Pumps, Ltd., is a new series of ships' vertical pumps now going into production which will include single- and two-stage units. Chemical and process pumps are also on view.

Included in the display of Merrill Pumps, Ltd., are motor driven pumps for circulating inhibited hydrochloric acid for descaling condensers and economizers in power stations, as well as for handling pickling acids in cable manufacturing works and plating liquors in miscellaneous electrical equipment manufacturing industries. The mechanical parts are completely isolated from the corrosive fluids handled by a tube diaphragm unit which houses suction and delivery valve boxes of simple construction.

Fork-lift trucks shown by Ransomes, Sims & Jefferies, Ltd., include trucks of from 10 to 40 cwt capacity, adaptable for use with varying types of load. Two-ton platform trucks are also available with fixed or elevating platforms, side tipping hoppers or end tipping bodies, and crane trucks which are exceptionally suitable for heavy single pieces or loading or unloading barrels and sacks from railway wagons or lorries.

INSTALLATION AND MAINTENANCE

From the installation and maintenance viewpoints the pipe bending machines exhibited by Lawler, Ayers & Co., Ltd., are of special interest. The model Lh110 hydraulic bending machine is specially arranged to enable conduit of up to 2in diameter to be bent by means of a hydraulic thrust unit. The bender incorporates special formers and rollers to minimize friction and perfect bends are achieved on all classes of heavy gauge conduit.

For the protection of documents, drawings, etc., Birlec, Ltd., has a small "edition" of the "Lectrodryer" moisture removers for industrial applications; but in this case it solves kindred

problems in strong rooms, filing safes and similar places. This standard equipment is known as the BE40 and is capable of maintaining a space of 3,500 cu ft at 50 per cent relative humidity at 70 deg F.

A section of the makers' "Light Line" installed on the stand of Crompton Parkinson, Ltd., demonstrates how this system of continuous trunking, control gear assembly, and reflectors, used as standard throughout an industrial plant, can provide maximum flexibility to allow for fluorescent lighting to be placed where required, or for the reflectors to be moved with alterations in plant layout.

Silentbloc, Ltd., has a working model demonstrating the "Silentbloc-Interlock" system which is of particular interest to installation engineers. The system can be embodied in plugs and sockets to give instantaneous automatic locking, and adapted for solderless terminal and wing connections which are vibration proof, impact and pull proof, and lock automatically on insertion. A new type of quick-acting panel fastener is also shown.

MARINE SERVICES

We have selected for reference just a few of the displays devoted to general marine services, i.e., apart from propulsion. Equipment for marine services displayed by the British Thomson-Houston Co. includes a type RMS.2 marine radar equipment; an electric galley range manufactured by Henry Wilson, Ltd., and fitted with "Pyrobar" heating elements; and a type DS.14N d.c. generator, forming part of an 8,300 s.h.p. single-screw turbo-electric installation in which it serves as an exciter for the main propulsion circuit.

The General Electric Co., Ltd., is showing various types of marine equipment including a section of an a.c. switchboard; typical a.c. and d.c. motors with control gear; "Aerofoil" fans manufactured by Woods of Colchester, Ltd.; a telephone switchboard; fire-alarm equipment; and lighting fittings.

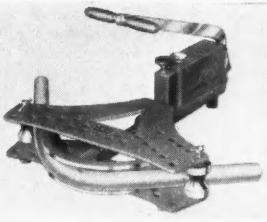
One interesting item in the 28 listed fan exhibits of Keith Blackman, Ltd., is the "Tornado" 27in high efficiency axial fan which has a cast silicon aluminium impeller with seven aerofoil section blades. The fan shaft is carried by two ball bearings in a cast iron housing which is supported centrally in a mild steel casing by tie rods. The fan is indirectly driven by an electric motor mounted on an adjustable platform on the fan casing. The V-rope transmission is protected by sheet steel guards. The output is 13,000 cu ft/min at 2·7in t.w.g., the s.c. motor being a 10 h.p. 1,440 r.p.m. totally enclosed, surface cooled machine.

What are believed to be the only electric ships' whistles in the world are the "Secomak" products which are being displayed by the Service Electric Co., Ltd. Briefly the whistle consists of a sound rotor driven at high speed inside a stator by an electric motor. A dome-shaped shutter completely encloses these sound-producing parts and is raised and lowered automatically.

COMMUNICATIONS

The electric telegraphs which are shown by Mechans, Ltd., possess some unique design features. The Smiths "Desynn" system is used, with potential difference to operate the alarm system. This ensures that alarms will continue to sound until the order signalled from the

Left: **Ransomes fork-lift electric truck with Hydrum load clamp**



Lawler-Ayres hydraulic tube bending machine

Keith Blackman "Weldafume"

bridge is lined up by the reply from the engine room receiver. A "wrong way" alarm arrangement, which is operated by the camshaft, the engine control lever, or the propeller shaft, prevents a wrong manœuvre.

The new Mark III "Synchrostep" electric telegraphs exhibited by Chadburns (Liverpool), Ltd., represent a considerable simplification of the original Mark I and Mark II models, there being complete interchangeability of all parts by the provision of readily detachable and renewable chassis containing all the electrical components. The mechanical and electrical elements of the instrument have been segregated, ensuring that the electrical equipment is completely watertight.

WELDING SECTION

There is a separately organized section of the Exhibition for welding, and a large and representative display has been got together.

Very heavy duty arc welding is depicted on the stand of G. A. Harvey & Co. (London), Ltd., illustrating the type of work which prompted the company to advance the extensions to its heavy construction and fusion welding shops where, for instance, gas-oil separators are made from 3in thick mild steel plate 4ft 6in in diameter by 170ft long. The actual display includes a 4in thick mild steel spun head 6ft in diameter and a 2in thick stainless steel spun head.

The SA 150A generator, the SA 150A motor-generator, and the SAE 300A motor-generator welding sets being displayed by the Lincoln Electric Co., Ltd., are all similar, except for size, and they all embody the dual continuous control system. The single-operator, variable-voltage generator has laminated pole pieces and the output can be varied both as to voltage and current, independently. It produces uniform current, of high responsiveness, for the speedy welding of all metals and alloys, light-gauge and heavy materials, and it can be used with either bare or shielded-arc type electrodes.

An arc welding generator which may be seen on the stand of Murex Welding Processes, Ltd., incorporates a new brush shift principle, and a special feature of the equipment is its ability to vary the current in infinite steps irrespective of the open circuit voltage. The generator can be incorporated in all Murex motor-generator sets and diesel and petrol-engine driven equipments. The generator has drooping characteristics and a current range of 15 to 300 A for continuous hand welding. The open circuit voltage can be varied from 70 to 90 V.

Mobile diesel-electric arc welding sets with continuous outputs of from 240 to 500 A are being displayed by British Twin Disc & Clarifiers, Ltd. In each case a Lister FR diesel engine is directly coupled to a cumulative compound wound drip proof d.c. generator with a special drooping characteristic. The outfit includes a main current selector switch embodying a "click action" locator. Dual control of the generator output is provided by separate voltage and fine current controls operated independently of the main current selector.

A comprehensive display of Metrovick welding equipment includes resistance, automatic arc, inert arc, and atomic hydrogen welding plant and a range of arc welding electrodes. The automatic arc welding equipment incorporates the latest design of travel carriage, which enables welding speeds of from 3·5in to 55in per minute to be obtained. The electronically controlled welding head can be mounted either directly on this carriage or on a projecting slide which can quite easily be fitted to it, and it is suitable for a very wide range of electrodes without adjustment. The angular adjustment faceplate and variety of mounting positions permit easy positioning for practically any butt or fillet welds in the down-hand or horizontal-vertical position.

Manual continuous and self-propelled arc welding machines are shown by Fusarc, Ltd. The manual continuous welding machine opens up a new field for machine welding at high speeds. By the use of the Fusarc continuous electrode welding currents of up to 600 A can be employed. The welding head is used in conjunction with a specially designed control cubicle. The base is mounted on castors and carries the cubicle which itself can rotate through 360 deg, thus enabling it to be easily moved to suit welding shop requirements. The cubicle is fitted with a counterbalanced arm which supports the hollow electrode carrying the cable to the welding head, thus relieving the operator of the weight of the cable.

A Reyrolle contribution to the welding section of the Exhibition takes the form of three single-operator arc welding generators with drooping-voltage characteristics. One set has a maximum welding output of 425 A, the second of 300 A, and the third of 175 A, all with an open-circuit voltage of 70. The control and starter units are conveniently mounted above the machine frames and the 300 A set has a concentric-dual control which enables the most suitable current for a particular welding run to be readily selected by means of an outer handwheel.

An important contribution to a.c. welding is displayed by the British Oxygen Co., Ltd., in the form of a static core oil cooled a.c. welding transformer equipment which will provide a maximum continuous welding current of 300 A. A rotary switch allows the selection of an open-circuit voltage of either 100 or 110 V, with primary winding tappings for single-phase voltages of from 380 to 440. Two rotary seven-position current selector switches give a choice of 49 current tappings. High frequency is provided by a spark gap oscillator having an output frequency of 300 kc/s, and a bank of electrolytic condensers is provided for d.c.

Mechans
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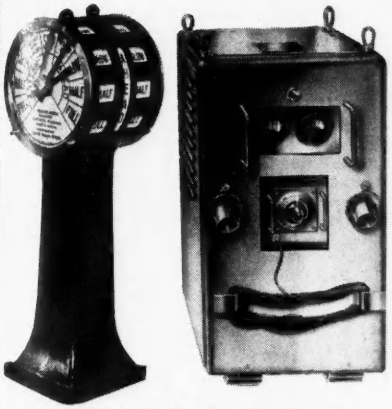
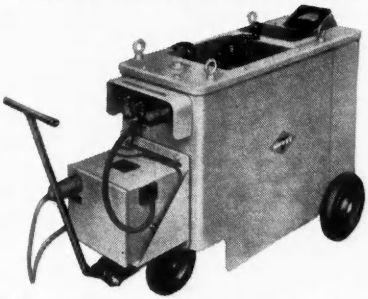
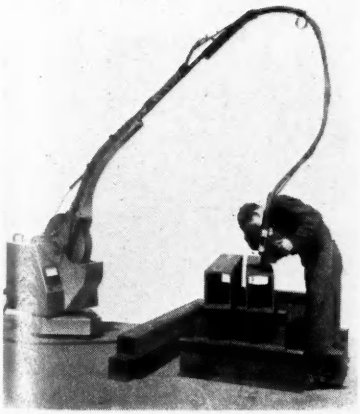


Mechans ships' electric telegraph unit. *Right:* Quasi-Arc " Stat-Arc " rectifier welding set



Murex arc welding transformer with l.v. device.

Below : **Fusarc continuous welding machine**



suppression in the welding of aluminium and magnesium; this can be short-circuited by a rotary switch as required.

The " Stat-Arc " single-operator metal rectifier welding set which is being displayed by the Quasi Arc Co., Ltd., is believed to be the first British made selenium plate metal rectifier arc welding set. It takes a balanced three-phase input and is specially designed for the remote control of the full welding current range by means of a single control knob. Remote control of the welding current provides the operator with full current adjustment at the point of welding. The set will supply the maximum welding current of 375 A at 30 arc volts in a 50 per cent duty cycle. The stable VA characteristic of the d.c. output permits all types of electrodes within the current range to be easily deposited.

Successful electric welding depends largely upon the selection of the correct materials and procedure for the job, and in this connection the display of Johnson, Matthey & Co., Ltd., is of interest. It comprises three main sections, covering low temperature silver brazing alloys, materials and components for resistance welding, and chemical plant.

The following are some of the welding materials and their applications which are being displayed by Eutectic Welding Alloys Co., Ltd.: Eutectrode 24 (machinable) and Eutectrode 27 (non-machinable) for cold welding of cast-iron; " Chamfertrode " for gouging all metals; " Cuttrode " for cutting all metals; " Thermotrode " for pre- and post-heating.

Unifluxes, Ltd., exhibit includes four grades of flux each being known by its distinctive colour and having its own particular use in the welding and brazing of aluminium and its alloys. Special attention is drawn to the red " Uniflux " which is an entirely non-corrosive welding flux, and as such has been approved by the Ministry of Supply for use in aircraft and aircraft equipment.

Although outside the electrical sphere in regard to the main function, there is electrical interest in the oxygen flame cutting machines of Hancock & Co. (Engineers), Ltd., by virtue of the electrical and magnetic control of the tracer heads. The outstanding electrical exhibit by this company is the electronically controlled tracer drive developed by the Metropolitan-Vickers Electrical Co., Ltd., for use with the latest Hancock longitudinal profiling machines.

Among the principal examples of resistance welding plant by Sciaky Electric Welding Machines, Ltd., is the Type SMC.100 motor driven stitch and pitch spot welding machine which is nominally rated at 100 kVA. This machine incorporates new features in automatic pressure control and stitch speed control, with welding speeds up to 120 spots per minute and an electrode pressure of up to 1,750 lb. Another notable Sciaky exhibit is the 75 kVA universal motor driven, air operated, seam welding

machine which has arms which permit a working throat depth of 26in and a welding capacity up to 16 s.w.g. + 16 s.w.g. mild steel. A range of welding speeds from 3ft/min to 12 ft/min is available. Two bottom electrode assembly inserts are provided, one for longitudinal seams and one for circumferential seams.

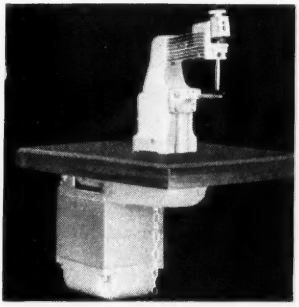
A.I. Electric Welding Machines, Ltd., are showing some recent developments, particularly in the flash butt welding field. For the railways and the carriage and wagon industries their new range of general purpose automatic flash butt welding machines are of particular interest. These machines have been designed to cover a wide variety of assembly operations in these heavy industries, such as buffers, foundation rings, three-link couplings, brake beams, etc. In the field of electric resistance heating new developments are typified in the A.I. automatic electric pipe heating machine which is an economic method of heating pipes for bending operations.

Exhibits of the Westminster Engineering Co., Ltd., include a plate edge scaling machine for preparing two surfaces simultaneously before seam or spot welding; a self-contained 11 kVA automatic motor driven spot welder for easy operation and quick response to control, with mechanical timing and simple adjustments; and a 7·5 kVA butt welder having automatic upset and trip control.

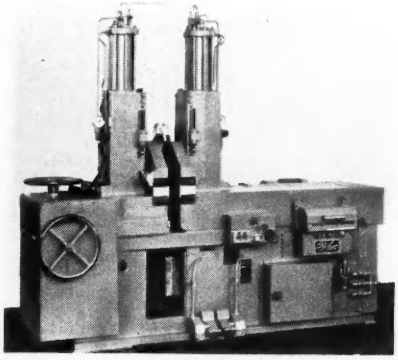
A.R.O. Machinery Co., Ltd., exhibits a wide range of robust spot welding machines, including bench, portable and pedestal types. The portable equipment is capable of relatively heavy work, and in models P271 and P272 the arms and the weld timers are two separate units connected by a flexible lead. The 17 kVA welding transformer is built into the gun itself and is very small physically because of the reduction in length of the secondary leads to the electrodes.

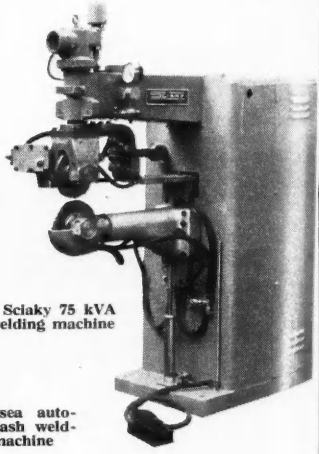
A comprehensive display of welding equipment by Asea Electric, Ltd., includes a "Three-in-One" resistance welder which provides for longitudinal seam welding, circumferential seam welding and spot welding by means of interchangeable heads. The machine can be air- or foot-operated, and it can be adapted for the longitudinal welding of tube down to 3in diameter. Special arms can also be provided for curved tube sections. On the seam welding head, the speed of the driving electrode wheel can be varied from zero to maximum, providing stepless infinite travel speed control. There is also an Asea automatic flash welding machine with hydraulic clamping, the clamping force being 852 lb/sq in. It has automatically operated motor-driven upset travel.

A comprehensive range of assembly welding benches is represented in the exhibits of Hirst Electronic Development, Ltd. These benches have been specially designed to assist the operator to attain the highest possible performance. Distinctive features of the production



Hirst precision spot welding head





Right: **Sciaky 75 kVA seam welding machine**

Left: **Asea automatic flash welding machine**

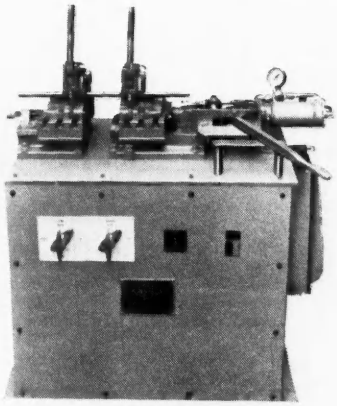
models are: dimensions of all the components are governed by the functional requirements of the operator; all-steel construction; a working surface of "Formica" in matt green finish, providing a clean and virtually non-destructible surface; a hand rest moulding in mahogany which is warm and restful to the hands; accommodation for the personal effects of the operator in two spacious drawers; and a control panel which is self-contained and conveniently situated for easy manipulation.

A special purpose spot welding machine displayed by New Process Welders, Ltd., is designed for welding the intersection joints of the wire reinforcements of concrete pipes. The material to be welded varies from No. 10 gauge to 0·375in diameter and the reinforcements are 9ft in length. This necessitated the building of a machine with a 9ft throat, the longest ever made, it is believed. A butt welding machine for copper rods works on an entirely new principle. The upset is achieved by a combination of hand and pneumatic power, and the machine is intended for 0·5in, 0·625in and 0·75in diameter rods. For these sizes the respective power demands are only 20 kVA, 40 kVA and 65 kVA.

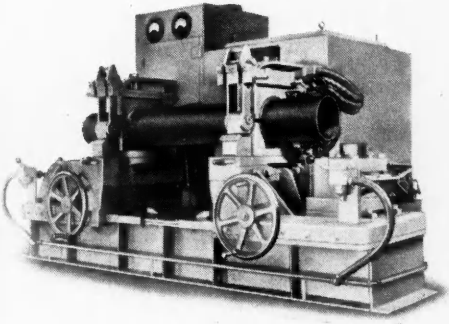
Three pedal operated spot welding machines of 5, 10 and 15 kVA rating, being well suited for sheet metal main and sub-assembly work, and having between them a variety of arm set-ups which facilitate the welding of other than straightforward jobs, are exhibits of Holden & Hunt, Ltd. An allied welding exhibit is a twin head heavy duty rivet heating machine of 16 kW capacity. It is capable of heating rivets up to $\frac{3}{4}$in diameter by 4in long.

On the stand of the English Electric Co., Ltd., both single-operator and multi-operator a.c. welding equipments are on view, as are also welding electrodes and h.f. ionizers. The ignitron exhibits include the designs AR31 and AR10, which are primarily intended for the control of resistance welders.

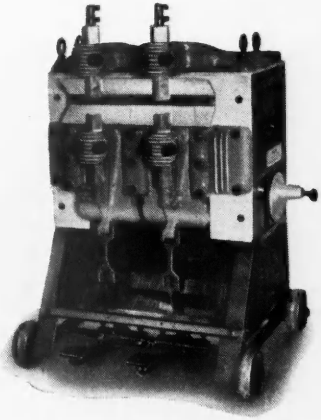
A noteworthy exhibitor in the welding section of the Exhibition for the first time is the Crompton Parkinson Stud Welding Organization —a recently formed member of the Crompton Parkinson group. The purpose is to co-ordinate sales and engineering facilities for both the Nelson and Cyc-Arc ranges of equipment with the object of providing a comprehensive service for users of stud welding equipment. The exhibit represents the range of equipments available, and shows something of the scope of its application by samples of end-welded studs and attachments adopted for various constructional requirements in different industries.



New Process butt welding machine for copper rods



A.I. electric pipe heating machine



Holden & Hunt two-head heavy duty rivet heating machine

SHEFFIELD STORE LIGHTING

Specially Designed Fittings for "Honeycomb" Ceiling

AN unusual method of departmental store lighting has been carried out by John Walsh, Ltd., in their new Sheffield store erected on the site of the old one destroyed during the war. The general ceiling lighting is carried out by a system consisting of a "honeycomb" ceiling into any space of which a lighting fitting can be fixed. Except where there are lighting fittings, the rectangular spaces formed by the timber ribs can be used for access to all services; these are immediately on the underside of the structural concrete floor, the whole of which has been painted black.

The special lighting units consist of three main parts—the frame to fit into the rectangle, the louvre for attaching to the underside of the frame, and the fitting itself, consisting of a deep inverted pan-shaped reflector in which are mounted four 40 W fluorescent lamps (colour white 3,500 deg K) and two 75 W architectural lamps. The 4ft long fluorescent lamps are spaced roughly equally inside the reflector and the two architectural lamps are placed between the two outer fluorescent lamps; all lamps are connected at the same time and the resulting blended light has a very pleasing effect. The lower edges of the louvre veins are pierced with a small star-shaped design, introducing a certain amount of sparkle to the otherwise flat appearance of the louvres.

The whole fitting is portable to the extent that it can be placed in any desired rectangle in the ceiling, electrically connected to the nearest socket outlet, a number of which have been fixed on the top of the ribs, with the result that practically any amount of illumination can be obtained at any desired part of the sales floor.

Special fluorescent lighting is employed for illuminating the portable case top counters, operating from 40 W ballast units and using 4ft white lamps similar to those in the ceiling fittings. All the ballast units in this installation are "Surestart" (Smart & Brown (Engineers), Ltd.), which are so designed that instant starting is obtained with any recognized make of fluorescent lamps, those used in this instance being Smart & Brown's and "Atlas." No earthing of the unit or tube is required, and operation is maintained with considerable cuts in voltage. There will be approximately 350 to 400 of the special fittings and altogether 1,800 to 2,000 40 W "Surestart" ballast units are utilized at present in this installation.

The scheme was designed by the architects, J. W. Beaumont & Sons, in conjunction with F. H. Wheeler (Sheffield), Ltd., electrical contractors, and under the supervision of Messrs. J. Stinton Jones and Partners, consulting engineers. The special fluorescent lighting fittings described were designed by the architects and contractors after extensive experiments, and were manufactured by Smart & Brown.

Part of the new store of John Walsh, Ltd., showing the method of lighting. Inset: one of the fittings

BRAZILIAN NEWS

Trend Towards State Control of Electricity Supply

From Our Rio de Janeiro Correspondent

EXCEPT in the Rio-Sao Paulo area, served by the Brazilian Traction, Light & Power, and in the widely-scattered districts supplied by the twelve subsidiaries of Empresas Electricas (Bond & Share), the production and distribution of electricity in Brazil is rapidly becoming a State monopoly. This branch of the public service was originally developed by foreign capital, mainly British, in Sao Paulo and the big coastal towns and by small Brazilian companies elsewhere. The resources of the latter proved inadequate to meet the present-day demand for electricity, because of growing populations and industrial expansion, and private investors are no longer attracted to a service in which tariffs are controlled and cannot be adjusted to production costs. Increases of capacity and new installations must, therefore, be financed by Federal, State or municipal administrations.

Amazon Region Development

In North Brazil, at Manaos and Belem (Para), light and power services have been taken over by so-called "mixed economy societies," in which the capital is actually subscribed almost, if not entirely, by the Government and its subordinate agencies. Central power stations, with a minimum capacity of 20,000 kW, are being built in both cities with funds provided by the Commission for the Economic Development of the Amazon Region.

In the north-east the state-owned Companhia Hydroelectrica do Sao Francisco, founded in 1948, will eventually supply electricity to 347 municipalities in the States of Paraiba, Pernambuco, Alagoas, Sergipe and Bahia. Transmission lines (230 kV) to Recife and Salvador, 243 and 214 miles distant, are nearly completed and the first two 60 MW generators will begin operating within nine months. A third set, also 60 MW, will be installed in 1954 and 4 cities in Paraiba, Alagoas and Sergipe will then be connected up, receiving an abundant supply at low rates.

Private companies cannot compete with this vast State network and have no incentive to raise capacities. Those of the Bond & Share group, which serve the capitals of Alagoas, Bahia and Pernambuco, have ceased planning for the future and are merely installing small oil-driven generators to meet immediate needs. A similar policy has been adopted in Minas Geraes and Rio Grande do Sul, in areas on which State enterprises encroach. In others, and in parts of Sao Paulo, Empresas Electricas associates continue to expand. The Export-Import Bank's loan of $41 million will enable them to complete the electrification of Americana, a new industrial city in Sao Paulo, and the project for a thermal station in the State of Rio, but a substantial new investment will be needed for their long-term plans, which include the construction of power plants on the Rio Grande, in Sao Paulo.

Hydro-Electric Schemes

Sao Paulo's four-year plan provides for the building of nine hydro-electric stations at a total cost of £90 million, namely, two of 80,000 h.p. each on the River Paranapanema, at Salto Grande and Jurimirim; two on the River Pardo, at Limoeiro and Eucludes da Cunha, of 40,000 and 90,000 h.p. respectively; one of 50,000 h.p. on the River Capivari; three on the River Tiete, with a total potential of 30,000 h.p., and one at Caraguatuba, on the Paraiba River, where a potential of 500,000 h.p. is available. Part of the work is well advanced and should start in all sectors within the next eighteen months. These stations will supply municipalities which now rely on small independent companies or have no electricity at all. They will facilitate the installation of local industries and help to avoid excessive concentration in the neighbourhood of the capital.

Official intervention is spreading to all parts of the country, in view of the apparent impossibility of interesting private investors in electrification programmes. The State Government of Rio has bought up and amalgamated a number of small installations and is building a 12 MW station at Macabu. The northern parts of Goias and Mato Grosso and a section of Minas Geraes will receive energy from a 300 MW station to be built by the Federal Government at the Dourado Falls, on the Paranaiba River. The Parana Administration is to build a 78 MW station at Cachoeira de Capivari, Mato Grosso is to install one at Mimosa and the Goias Government is to exploit the Rochedo Cataract on the Maia Ponte River. Bahia has created a special fund to increase installed capacity, formed a company with mixed State and private capital to build stations at the Funil and Pancada Falls, and plans to build three others within the next five years.

Financing State Projects

The first Brazilian State to adopt an electrification programme was Rio Grande do Sul, whose Electricity Board, in 1943, drew up a plan to be carried out in two stages. The first, which increases installed capacity by 52·6 MW, has been practically completed at a cost of £8 million. The second stage, recently initiated, will add 122·8 MW and entail an expenditure of £28 million. The World Bank is lending U.S. $25 million to finance imports and the Federal Government is contributing £500,000 annually.

In Minas Geraes the Government has organized a group of State-administered companies to build and exploit seven power stations and raise the capacity of two existing plants belonging to the State. The work will be financed from the proceeds of a special tax, and by grants from the Federal Treasury and the Sao Francisco Valley Development Commission. In July the World Bank approved a loan of U.S. $7·3 million for the purchase of equipment for the Alto Rio Grande and Itutinga stations.

In view of these widespread plans by Federal and State Governments, Brazilian municipalities can no longer, as in the past, look to private enterprise to install power plants. Many of the smaller ones now do their own generation and distribution, not always very successfully, while others rely on Federal or State supplies. A few private installations have survived, and will continue to do so for some time, as concessions to individuals in backward areas to generate power for their own services carry a clause obliging the concessionaires to supply electricity for public consumption at fixed rates.

Egyptian Imports

WITH a total value last year of £E9,015,000, Egypt's imports of electrical machinery and apparatus showed an increase on 1951 of about 9 per cent. There were big advances in power plant and cable, but these were offset by declines in domestic appliances and other smaller types of apparatus. The following table gives the 1952 totals of the chief items with notes of increases or decreases compared with 1951. The Netherlands had the largest share of the lamp trade, namely rather more than one third, while Britain came next with about one quarter; Hungary was a small supplier. There was a falling off in Britain's trade in wires and cables although total imports of this kind expanded substantially. (Egyptian £ = 20s 6d.)

Class of Equipment	1952 £E (000)	Inc. or dec. on 1951 £E (000)
Generators, motors and transformers	993	+ 679
From Britain	203	+ 19
„ Switzerland	55	+ 20
„ Belgium	73	+ 71
Electric locomotives	91	— 77
Magnetos and sparking apparatus	108	— 22
Accumulators and parts	368	+ 169
From Britain	88	— 23
„ United States ..	3	— 1
Batteries, not pocket, and parts ..	287	+ 33
Pocket batteries	34	— 27
Fans	38	— 12
Radio valves (transmitting) ..	2	— 7
Radio valves (receiving)	212	
Electro-medical apparatus ..	125	— 24
Electric lamps up to 40 W ..	60	— 34
Ditto, 40 to 100 W	21	— 13
Ditto, over 100 W	25	— 102
Telegraph and telephone apparatus, ordinary and parts	732	— 116
From Britain	212	— 70
Radio receiving sets	1,076	— 52
From Britain	310	— 170
„ United States ..	29	— 16
„ Netherlands	443	+ 130
Radio transmitting sets	11	— 7
Radio fittings and parts	147	+ 1
Other radio apparatus	32	+ 5
Irons	13	— 5
Insulated tubes, metal-covered ..	45	— 5
Signalling apparatus	16	— 1
Refrigerators, household	355	— 172
Other domestic apparatus ..	194	+ 5
Cable, insulated, submarine and underground	1,453	+ 811
From Britain	249	— 2
Wire and cable, electric, unspecified and parts	407	+ 3
From Britain	124	— 2
„ Italy	102	+ 88

Belfast Corporation Contract

Application for an Injunction

SITTING as Vacation Judge in the High Court, Belfast, on 26th and 27th August, Mr. Justice Curran heard an application for an injunction restraining Belfast Corporation from entering into a contract with Babcock & Wilcox, Ltd., for the supply of seven boilers and equipment for the new Victoria power station, Belfast, without first inviting tenders by public advertisement. The Corporation recently accepted the company's tender which amounted to almost £3,000,000.

The application was made on behalf of Alderman Major Cecil McKee, a member of the Corporation, and other interested parties. Mr. C. Nicholson, Q.C., represented the applicants and in his application contended that the Corporation was bound under the Act of 1948 and its standing orders to advertise publicly for tenders. Because of failure to do that, it was alleged, the substantial sum of £250,000 had been lost to the ratepayers. He read an affidavit by Alderman McKee that no tender had been invited outside the Water Tube Boiler Makers' Association.

When Mr. Justice Curran pointed out that there was some reference to a " price ring," Mr. Nicholson said that method limited competition to five firms and that there was no suggestion of anything other than that the Corporation had made an error of judgment. Mr. Warnock, Q.C., the Attorney-General, appearing for the Corporation, said that the new plant should be in operation by the winter of 1956–57. If not, there would be load shedding in all probability. A delay of two or three months would be a very serious matter. Mr. Warnock, replying to a remark of Mr. Justice Curran, said that no person other than a Minister could ask for a mandamus against Belfast Corporation, as the Ministry was the successor of the Local Government Board. That Board had applied in many cases for a mandamus to compel local authorities to transfer contracts. There was not one case in which a local authority had been compelled to perform its function at the suit of an individual, unless the individual concerned showed a perfect right. The Attorney-General said that it was his duty to point out the difficulty so that an order would not be made which might be bad in law, though he realized that it would be an unsatisfactory way of disposing of the case for his Lordship to find that Alderman McKee had no legal right as a citizen or ratepayer to ask for a mandamus order. The Attorney-General said he wanted his Lordship to decide the matter on an entirely different ground.

Mr. Justice Curran said he was not there to investigate the way the Corporation dealt with matters. The question was whether the Corporation had obeyed standing orders or not.

Summarizing the Corporation's case at the resumed hearing, the Attorney-General held that Alderman McKee was not entitled to apply for an order. There was no default in compliance with standing orders. If there was a default, it was a matter of form and not of substance. The purpose of standing orders was to ensure that if a final decision was taken the Council was fully informed. There was no evidence that a private arrangement had been made among the firms which had submitted tenders. There was no evidence worthy of consideration that the Corporation would lose £225,000 or any sum. The issue of a writ was discretionary, and even if the Corporation was technically in error, that error had been obliterated by the full disclosure of the facts when it took the final decision on 27th July.

He read a letter from the Mitchell Engineering Co., Ltd., addressed to the Town Clerk and submitted to the Electricity Committee, stating that had that company been asked to quote its prices would have been in the neighbourhood of 10 per cent lower than figures usually quoted by the Boiler Makers' Association. The Attorney-General said that when the company wrote that letter it had not got the specification and did not know the work that was to be done.

Mr. Nicholson said it was idle for the Attorney-General to say that the matter had been given full consideration. There was nothing on record to show that a complete determination had been made. He said that the Corporation must put on record why it departed from rule.

At a later point, Mr. Nicholson raised the question of a possible surcharge on the members by the Local Government Auditor. Mr. Justice Curran remarked " I was just wondering on what the Local Government Auditor would base a possible surcharge. What would the difference have been if the contract had gone by public tender? " His Lordship further remarked that it seemed to him that there were indications of special consideration and based upon that the Corporation had exercised its discretion. Mr. Nicholson quoted 73 cases in 1952–53 in which the reasons for departure from rule were given, but in this very large contract it was obvious that the usual practice had been departed from.

His Lordship reserved his decision, which he said he would give as soon as possible.

Close-Regulation Alternator

New Design for Small A.C. Generating Plant

By A. H. MAGGS, B.Sc., A.M.I.E.E.*

THE "Stavolt" alternator developed by the British Thomson-Houston Co., Ltd., maintains an output voltage at rated speed within ± 5 per cent from no load to full load at any power factor from unity to 0·8 lagging. The alternator, which is self-excited, does not incorporate an automatic voltage regulator and a field rheostat is not required. The machine has been designed to meet the demand for a simple, low-cost engine-driven alternator suitable for small-power, isolated a.c. generating plant, such as is required on farms remote from a public electricity supply. In the design, emphasis has been placed on extreme simplicity and reliability.

The alternator is a rotating armature machine in which the armature carries two separate windings. These are the a.c. winding which occupies the lower portion of the slots and is connected to slip-rings mounted on a shaft extension at the non-drive end; and a smaller winding connected to a commutator (see Fig. 2). The output current is taken from the slip-rings and the exciting current from the commutator, the d.c. brushes being connected directly to the field winding. The stationary field system comprises a cast-iron frame carrying slotted laminations and the field winding, in the slots, takes the form of a distributed lap winding. The commutator is inside the end-shield at the driving end, an arrangement which makes the alternator more symmetrical than if it were at the non-drive end (see Fig. 1).

* B.T.H. Motor Engineering Department.

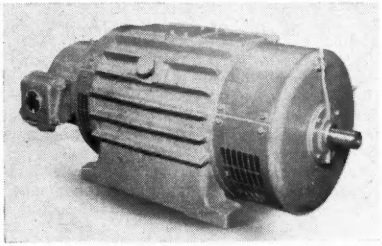
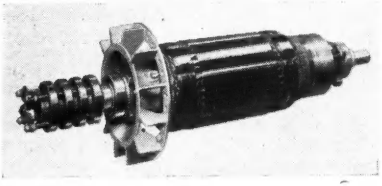


Fig. 1.—"Stavolt" alternator and (below) Fig. 2.—The armature



The terminal voltage characteristics at rated speed and varying load conditions are shown in Figs. 3 and 4. Fig. 3 shows the line voltage for balanced three-phase loads at unity and 0·8 power factors. For unity power factor loads the voltage is practically constant up to half load and the droop at full load is little more than 10 V; for loads at 0·8 power factor the droop at full load is little more than 30 V. Fig. 4 shows the corresponding characteristics for single-phase loads connected alternatively between two lines and between one line and neutral. In each case the relative voltage droops are less than those with three-phase loads.

Since the alternator is basically a constant "volts per c/s" machine the voltage depends on the speed and hence the resultant voltage characteristic depends on the governor characteristic when the alternator is engine driven. According to B.S. 649 the speed droop of an engine when driving an isolated electrical machine should not exceed 4 per cent.

The excellence of the unity power factor characteristic, taking into account the speed droop with load, makes the machine particularly suitable for a lighting or domestic load. Even when supplying motors simultaneously the voltage drop is within the statutory limits of variation permitted in a public supply system.

The windings and internal connections of the alternator are shown diagrammatically in Fig. 5, which illustrates the simplicity of the machine. The a.c. rotor winding is shown as a star-connected winding with the neutral brought out to a fourth ring, but in practice all six phase-ends are brought out through the shaft hole, thus enabling the machine to be delta-connected if required. The field has a delta-connected lap winding with two of the terminals joined to form one of the two main terminals. This short-circuits the winding along an axis electrically at right-angles with the magnetizing axis of the winding. Delta connection is preferable to star for a three-phase winding with two terminals joined, because heating of the winding is more uniform with the former than with the latter connection.

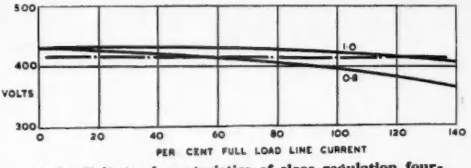


Fig. 3.—Voltage characteristics of close-regulation four-pole alternator rated at 6·25 kVA, 0·8 p.f., 240/415 V, 50 c/s, 1,500 r.p.m. on balanced three-phase loads

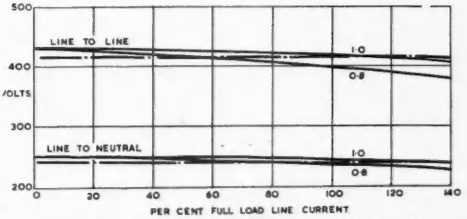


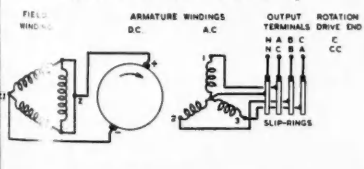
Fig. 4.—Voltage characteristics of close-regulation alternator as in Fig. 3 on single-phase loads

The inherently close voltage regulation characteristic of this type of machine is accounted for mainly by the design of the magnetic circuit. The part of the rotor core beneath the slots (see Fig. 6), is so designed as to be highly saturated under all conditions of load. The spokes connecting the inner and outer portions of the core are also highly saturated, and this feature, in conjunction with an adequate amount of iron for the inner portion of the core, ensures that the latter cannot itself become saturated, and consequently that flux is not forced into the rotor shaft.

In a machine with characteristics dependent on iron in a highly saturated condition the characteristics of the iron itself are of vital importance. It is fortunate that in the case of electrical sheet steel containing a moderate percentage of silicon and known as "medium resistance," the value of flux density corresponding to a given value of magnetizing force well beyond the knee of the B-H curve is usually well within the limits of ±1 per cent of the average for a large number of samples. To utilize effectively this property of the steel it is essential that the laminations should be accurately made and that the assembled core should contain a definite quantity of steel. B.T.H. standard practice in the production of laminations is such that nothing more than the usual precautions concerning die setting is required. The laminations are annealed after notching, however, in order to restore the magnetic characteristics which may have been affected by the operation. Finally, the core is assembled by weight and not by depth of stacking.

A close study of the magnetic circuit, with the object of securing the greatest possible constancy of the generated e.m.f., shows that the rotor core of a rotating armature machine is the best part of the circuit to saturate and that in each of the remaining parts no more than slight saturation should be permitted. Because of the high magnetizing force acting on the rotor core a part of the flux entering the rotor from the stator is inevitably forced out of the core into the adjacent parallel air paths. Under normal working conditions this flux amounts to about 8 per cent of the total flux entering the rotor, and it contributes to the generated e.m.f. This air path flux detracts somewhat from the constancy of the e.m.f. and the design is

Fig. 5.—Alternator connections



such as to keep it to the minimum. For example, the radial depth of the air ducts in the rotor is made large, and non-magnetic winding supports are used. The use of a damper to confine the flux to the core is not profitable since with such high magnetizing forces the loss involved is excessive.

A method of minimizing the effect of this air path flux is to employ a Gramme ring armature winding on a core which is mounted on a non-magnetic spider. This arrangement, however, is not sufficiently economical to be a practical alternative. A Gramme ring winding is costly and its efficiency is lower than that of a drum winding in the case of machines having normal ratios of core length to pole pitch. This ratio is made high for the "Stavolt" alternator in order to keep down the proportion of end air path flux. Moreover, with the Gramme ring winding, the air path flux contributes nothing to the e.m.f. although it has to be carried by the remainder of the magnetic circuit.

The stator portion of the magnetic circuit must be designed to carry the leakage flux which by-passes the rotor in addition to the working flux; this leakage flux may amount to 15 to 20 per cent of the working flux. Fortunately the cast-iron frame can be effectively used to form part of the "yoke," and in addition solid steel core end support rings can be incorporated if necessary.

In this type of alternator the leakage flux is fully established at no load, unlike that in the induction motor which is present only on load. Zero power factor lagging current in the armature winding makes no difference to the leakage flux except to reduce progressively towards the armature core the small portion of it which is partly linked with the a.c. winding.

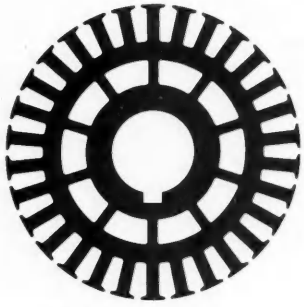


Fig. 6.—Rotor laminations

Because of the high saturation of the armature core the synchronous reactance of the alternator under normal working conditions is very low, being less than 0·1 per unit. If the excitation is reduced until saturation disappears, however, it rises to as much as 1·6 per unit; this is because the air-gap is smaller than that of a salient pole machine although not quite as small as the gap of an induction motor.

As a means of securing the smallest armature core loss and of avoiding stray fluxes external to the frame, the rotating armature type of machine is far superior to the rotating field type when the armature core is highly saturated. This is because the amount of iron in a rotor core is much less than that in an equivalent stator core and the stray flux is mainly confined within the inner radius of the core.

An advantage of the smooth core construction is that when the flux is "dragged" forward from the excitation axis by the armature reaction it does not suffer distortion or weakening owing to a change of air-gap reluctance such as would occur in a salient pole machine. This feature also assists in maintaining the close regulation characteristic. In addition, the wave-form which is practically sinusoidal is as good on load as at no load for loads which normally accept a sinusoidal current.

By setting the d.c. brushgear forward from neutral (about 30 electrical deg is suitable) a compounding effect is secured which is most pronounced at unity power factor and which falls off with decrease of power factor to nothing at zero lagging power factor. At unity and high power factors the armature reaction has a major component acting in lagging space quadrature with the field ampere-turns which causes the resultant ampere-turns, and hence the flux, to move forward from the field winding axis with load. Thus with forward shift of the brushgear the d.c. e.m.f. increases with load at high power factor. At zero lagging power factor the armature reaction is in space phase opposition to the field ampere-turns and hence there is no shift forward of the flux with load.

The simplified vector diagrams (Fig. 7) illustrate this effect; each is a time-phase diagram for full load conditions in any one

phase of the a.c. winding. In each diagram X_F represents the excitation (field) ampere-turns, X_A the armature ampere-turns (armature reaction) and X_R the resultant ampere-turns which produce the useful flux Φ; the flux generates the electromotive force E, in lagging quadrature with Φ, and E, which is also the terminal voltage—neglecting resistance and leakage reactance drops—maintains the load current I; X_A is, of course, in phase with I. θ, the angle between Φ and X_F, is the angle by which Φ lags behind X_F—in time—and by which also the flux is shifted in the direction of rotation from the excitation axis. The first diagram (a) is for unity power factor, the second (b) for 0·8 lagging and the third (c) for zero lagging power factor. In Fig. 7 (c) θ is zero.

An important feature of this form of compounding is that it does not cause instability when two alternators are operated in parallel, as can in fact occur with level- or over-compounding at zero lagging power factor unless equalizing connections are used in the excitation circuits. This means that "Stavolt" alternators do not need equalizing connections when they are required to operate in parallel. In this event, however, the droop characteristics of the engine governors should be alike if the load is to be shared proportionately.

Commutation at the d.c. brushes, which is effected by virtue of the brush contact resistance, is good because of the low-voltage design of the excitation circuit. The maximum potential between the leading and trailing edges of the brushes, which occurs at no load because of the forward shift, is in consequence low and well within the handling capacity of the brushes.

The reason for the excellence of the single-phase characteristics is that it is the mean value of the armature reaction over a cycle which is effective in determining, in conjunction with the field ampere-turns, the resultant ampere-turns for maintaining the flux. From this it follows that, neglecting the effect of armature resistance, the maximum available single-phase output current at zero power factor lagging is, for line-to-line operation, $\sqrt{3}$ times the maximum three-phase line current, and, for line to neutral operation, three times. The latter value is far in excess of the permissible continuous current based on armature heating. Single-phase tests have borne out

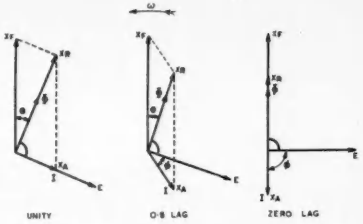


Fig. 7.—Vector diagrams

the correctness of the above ratios of maximum current. A "Stavolt" alternator designed purely as a single-phase machine can thus be rated at more than 60 per cent of the three-phase rating of the same frame size. In Fig. 4 full-load line current for the line-to-line curves represents 57·7 per cent of the three-phase rating.

Since single-phase or unbalanced loading sets up twice line frequency forces, it is important to consider the mechanical stiffness of the shaft in respect to these forces. In the new alternator the shaft is made sufficiently stiff for operation at frequencies up to 60 c/s. This precaution ensures substantial freedom from the twice line frequency vibration which can be caused by these forces in a machine of unsuitable design.

Indian Electrical Year Book

PRODUCED under the auspices of the Electrical Contractors' Association, Bombay, the "Indian Electrical Year Book 1952–53" is the first publication of its kind. Its purpose is to serve as a work of reference for electrical and allied manufacturers and traders. The book contains about 8,000 addresses.

Section 1 reviews the constitution of the Tariff Commission (formerly the Indian Tariff Board), power development under the first five-year plan, and the work of the Indian Standards Institution. Section 2 lists the names and addresses of manufacturers and representatives and Section 3 those of contractors and traders. Section 4 gives information about electricity undertakings (type of equipment, area of service and voltage of supply, etc.), while the remaining sections are devoted to air conditioning and refrigeration; electrical products and manufacturers; Indo-foreign trade representatives; and engineering and allied associations.

The Year Book is published by M. Largo-Afonso, 63, New Stock Exchange Building, Apollo Street, Fort, Bombay, 1, price 30s post free.

Meeting Demand in Malaya

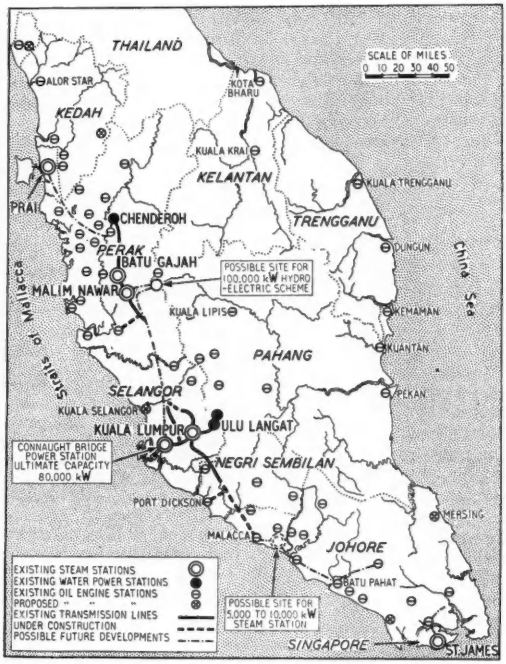
Progress of C.E.B.'s Construction Programme

WITH the commissioning of the first half of the Connaught Bridge power station (see *Electrical Review*, 3rd April, 1953) the Central Electricity Board has been able to lift all restrictions on the supply of electricity in Selangor, Negri Sembilan and Malacca. Other parts of the Federation, however, continue to suffer from a shortage of plant. Development plans for the next five years include the completion of the Connaught Bridge station (ultimate capacity 80,000 kW), construction of a new 30,000 kW steam station near Malacca, doubling the capacity of existing diesel stations, provision of unrestricted bulk supplies from Singapore for Southern Johore, and extension of the grid from Malacca to Muar. The cost of these schemes, excluding the Connaught Bridge station (for which loan funds have been provided by the Colonial Development Corporation), is estimated at £5·8 million and the Board is considering means of financing this work. For the future, it also has in mind the development of the country's water-power resources. One such project is the Cameron Highlands hydro-electric scheme where 100,000 kW may be developed, but preliminary work on this must await the end of the present emergency and the availability of additional funds.

The Board operates numerous small stations scattered throughout the Federation and in 1951–52 the first phase of a diesel plant expansion was begun, substantial quantities of equipment of this kind having been ordered from the United Kingdom. Eventually, 23 stations will have additional plant, though progress during the year was hindered by slow deliveries.

At the request of the Government the Board also undertook the work of providing electricity supplies to 180 new villages for security floodlighting as well as to afford domestic services, and orders were placed for diesel generators, floodlights and other equipment required for the programme.

The most important transmission scheme undertaken was the construction of a double circuit 66 kV interconnector between the Connaught Bridge and Bungsar (Kuala Lumpur) stations; this was nearing completion at the end of the year. Another major work was the erection of a 66 kV line from



Map showing public utility supply system in the Federation of Malaya

The Central Electricity Board's Connaught Bridge power station inaugurated earlier this year

Bungsar via Seremban to Malacca, with a total route length of 85 miles, entailing much forest clearance.

The securing of adequate staff remained a serious problem, shortage of accommodation being one of the main difficulties. To overcome this, housing quarters are being built at the Board's new undertakings at the same time as the power stations and offices. New contract terms have been arranged for senior officers, and facilities are available for the training of technical assistants in the United Kingdom.

During 1951–52 the Board, of which Mr. F. P. Egerton, C.B.E., M.I.E.E., is the general manager, sold 183·2 million kWh, an increase of 14·6 per cent. An additional 4,956 consumers were connected, making 59,418 altogether who used on an average 3,084 kWh during the year for which they paid 3·22d/kWh (in the previous year the average price was 2·84d). Revenue aggregated £2,445,000, there being a profit on the year of £195,804. The introduction of two-part tariffs is contemplated.

In the whole of the Federation 736·7 million kWh was generated in 1951–52; 118·8 million by private mining concerns and 618·0 million by public utilities. Of this amount 51·4 per cent was produced by steam plant, 37 per cent by water power and 11·6 per cent by diesel generators. An analysis of sales for various purposes is given in the accompanying table.

Electricity used for various purposes in the Federation

Application	Public Supplies	Private Plant
	Million kWh	Million kWh
Tin mining:		
Dredging	173·5	38·9
Opencast	182·8	40·6
Underground	—	15·7
Iron mining	—	2·5
Coal mining	9·3	5·0
Gold mining	—	4·9
Industrial and commercial ..	62·8	0·1
Lighting and domestic ..	89·3	—
Totals ..	517·7	107·7

Courses for Colliery Electricians

THE National Coal Board is arranging courses of training for all of its colliery electricians designed to improve the standard of their work. The courses are being organized by the Board's Training Branch at the request of the Production Department which felt that action was urgently needed to ensure safety and the proper use of electrical equipment. Since there are altogether 10,000 colliery electricians, the administrative problem involved was considerable. The Board already had in existence at Sheffield the Mines Mechanization Training Centre which was equipped to give the courses, but it was decided not to use the centre since its capacity was limited and this would have meant that the series of courses would have taken too long. It was therefore decided to use the Sheffield Centre for training tutors who would then go back to their own coalfields and conduct the courses. Those selected to act as tutors were area electrical engineers and senior electricians and they are being given a three weeks' course, one-third of which is spent in taking the five-day course which they themselves later give to their pupils, one-third in instructing them how to teach, and one-third in giving them practice as instructors.

The courses cover such matters as flameproof enclosures—design and maintenance; intrinsically-safe apparatus; testing, examination and reporting; fault location on cables and other equipment; the rating of switchgear; and the practical understanding of regulations. Lectures on these subjects are followed by practical demonstrations in which the students participate.

Double Shift Working

Minister of Labour's Memorandum

THE National Joint Advisory Council has had under consideration the advisability of extending double day shift working as a means of increasing production and lowering production costs. In response to the Council's invitation the Minister of Labour has sent a memorandum on the subject to the organizations concerned.

The memorandum sets out the various aspects which must be considered. It is said that double day shift working often entails increased labour costs either because the same weekly rates as for normal hours are paid for a shorter time or because extra payments are made by way of overtime rates or small additions to the hourly rates. This may be offset by an increased rate of production.

On the other hand there is a saving of overhead expenses the extent of which depends largely on the nature of the processes and the conditions of production. Also the capital charges for a given output are reduced. Thus where overheads and capital expenses are high in relation to labour costs the advantages of double shift working will be most marked.

Moreover, the extended use of the system would improve the position of the electricity supply industry by making it possible to use the generating plant more fully and reducing the peak demand.

Regarding the economical and social aspects it is said that there is no evidence that double shift working affects the health of workers but it may increase the housewife's burden and questions of normal social life and transport arrangements arise. Where double shift working is normal practice it has become accepted and is not unpopular, but workers are usually reluctant to make the change from day to shift work when it is first suggested.

In general British industry is equipped for single shift working but the introduction of the double shift would be of great value where the capital costs are high in relation to labour costs, markets can be developed (aided by lower production costs) and labour can be recruited to expand production on a two-shift basis; or it is necessary to expand output and the alternative would be to build an extension to the factory. The possible savings associated with the system should always be considered where there is the need to modernize and re-equip in order to maintain competitive efficiency and this re-equipment might be done at half the cost for the same output on double shift work.

It is considered that the question is one to be determined by industry itself locally through joint negotiating machinery.

Electrical Employment

DETAILS of the number of people engaged in the various sections of the electrical industry in Great Britain at the end of the first half of the current year are included in the August *Ministry of Labour Gazette*. These figures are reproduced in the accompanying table.

Unemployment figures as at 13th July are given in the *Gazette*. The numbers of wholly-unemployed and temporarily-stopped people in the electrical branches in Great Britain were as follows:—Electrical machinery, 1,055; electric wires and cables, 570; telegraph and telephone apparatus, 457; radio apparatus and gramophones, 884; radio valves and electric lamps, 348; batteries and accumulators, 244; other electrical goods, 1,391; electric wiring and contracting, 887; and electricity supply, 856.

Employment in the Electrical Industry (Thousands)

Branch of Industry	Males		Females		Total	
	End 1952	End June 1953	End 1952	End June 1953	End 1952	End June 1953
Electrical machinery	132·5	132·2	43·1	41·9	175·6	174·1
Electric wires and cables	40·0	37·9	22·8	21·1	62·8	59·0
Telegraph and telephone apparatus	33·4	32·5	22·1	20·9	55·5	53·4
Radio apparatus and gramophones	55·1	56·9	45·3	48·3	100·4	105·2
Radio valves and electric lamps	17·6	17·4	21·3	20·0	38·9	37·4
Batteries and accumulators	10·9	10·6	8·2	8·0	19·1	18·6
Other electrical goods	86·3	85·3	56·2	53·9	142·5	139·2
Electric wiring and contracting	59·7	59·8	7·9	7·9	67·6	67·7
Electricity supply	168·4	168·6	22·5	22·4	190·9	191·0

COMMERCE and INDUSTRY

Transformers for America

Large Flax Mill Installation

THE Bonneville Power Administration, Oregon, U.S.A., has instructed the English Electric Co., Ltd., to build a 250 MVA, three-phase transformer bank for service in its 230 kV transmission system. The windings of the transformer will be auto-connected for a voltage ratio of 230/115 kV and a delta-connected tertiary winding for 13·2 kV will be included. On the 230 kV winding, on-load tap-changing equipment will be provided for a voltage range of 15 per cent and on the 115 kV side there will be tappings for off-circuit operation for a range of 10 per cent. The cooling equipment will incorporate air-blast and forced oil circulation for the full output but the equipment will be adequate for an output of 150 MVA when the auxiliary cooling plant is idle. The transformer bank will comprise three single-phase units, each unit, with its oil, weighing 150 tons.

The Bonneville Power Administration operates a wide network in the States of Oregon and Washington. The power station, now being built at the Chief Joseph Dam on the Columbia River, will have an ultimate capacity of 1¾ million kW and practically the whole of the power generated will be delivered into the Administration's network. Power from the dam will be transformed up from the generator voltage to the transmission pressure of 230 kV through 310 MVA transformer banks which are being manufactured by the English Electric Co., Ltd., at its Stafford Works.

Diesel-Electric Shunting Locomotives

The announcement that British Railways has ordered ten diesel-electric shunting locomotive power equipments from Crompton Parkinson, Ltd., recalls the fact that this firm supplied equipments for use on the then London Midland and Scottish Railway as far back as 1935. They were built by Armstrong Whitworth and were of the jack shaft drive type, having double reduction gearing and forced ventilation of the traction motor.

The equipments now on order differ from the early design in that each will have two traction motors with double reduction gearing. The engine is to be a Crossley type ESNT6/90, developing 350 b.h.p. at 825 r.p.m. The generator is to be a single bearing machine with a belt driven exciter. A 40 cell lead-acid 138 Ah battery of Crompton Parkinson manufacture will be fitted. As in the case of the earlier locomotives the control gear is to be of Allen West design and manufacture.

Flax Mill Reconstruction

Before the war, the Belfast mill of the York Street Flax Spinning Co., Ltd., was the largest flax mill in the British Isles. Reconstruction of the mill, covering a greater area than before, is now well under way and the task of installing electric lighting throughout the plant will involve large quantities of equipment and materials. It is estimated that 36,000ft of conduit, 10,000ft of trunking and thousands of yards of v.i.r. cable will be required for over 1,500 lighting points. In addition, 4,000 yd of Siemens underground cable of various types will be incorporated in the power and lighting schemes. The main contractor for the lighting installation and supply of fittings and accessories is Siemens Lamps & Supplies, Ltd., whose design engineers are working in collaboration with the sub-contractors, James Crawford, Ltd.

Recent G.E.C. Contracts

The General Electric Co., Ltd., is to supply from its Fraser & Chalmers Engineering Works a coal handling plant including a wagon tippler to the order of the National Coal Board for modification of and extension to its Aberaman "Phurnacite" plant. The contract calls for a "Marshall" 35-ton special side discharging type wagon tippler, which will handle wagons of 8 to 24½ tons capacity, tipping a total of 12 wagons/hr. The contract will also include a belt conveyor system and scraper conveyors for transporting coal from the wagon tippler and delivering it to storage bunkers.

A further contract received from the National Coal Board, West Midlands Division, No. 2 (Cannock Chase) Area, is for two electric winder equipments for the new sinkings at Lea Hall Colliery. The equipment will include a single drum winder designed for an output of 280 tons per hour, and a double drum winder, of which one drum is clutched, designed for an output of 250 tons per hour. Both equipments will be arranged for dynamic braking, and will be driven by G.E.C. 2,100 h.p. 3·3 kV induction motors running at 375 r.p.m. The motors and control gear will be built at the Witton Engineering Works of the G.E.C.

The Fraser & Chalmers Engineering Works are also supplying to the order of Guest Keen Baldwins Iron & Steel Co., Ltd. (consulting engineers, McLellan & Partners) one 5,000 kW turbo-alternator set, complete with condensing plant. This set is for an extension to the existing power station at Guest Keen's East Moors Works, Cardiff.

Instrument Manual

The second edition of the "Instrument Manual" has just been published at 84s by the United Trade Press, Ltd., 9, Gough Square, Fleet Street, London, E.C.4. This 628-page book is a useful source of reference for the instrument engineer and it deals with almost every conceivable type of instrument for use in widely different industries. Many individual instruments are described in detail and methods and techniques of measurement are reviewed. The book also gives lists of organizations interested in instrumentation, relevant publications, manufacturers, accessories and components.

I.E.C. Fuse Specification

The first edition of a specification for fuses for voltages not exceeding 1,000 V, either a.c. or d.c., has been issued by the International Electrotechnical Commission, which is affiliated to the I.S.O. Copies of this publication are obtainable, price 10s 4d each post free, from the British Standards Institution, 2, Park Street, London, W.1.

Aerialite Extension

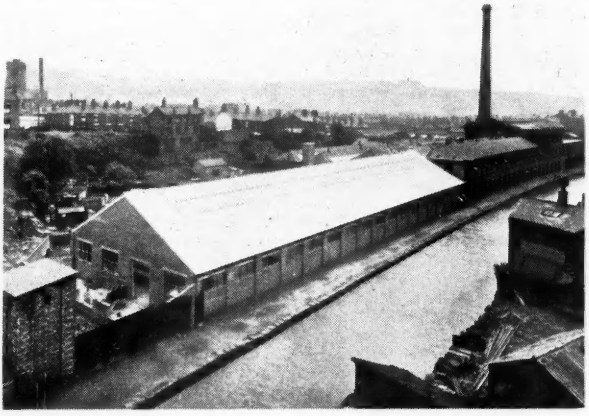
A new extension to its factory at Stalybridge has recently been completed by Aerialite, Ltd. The extension has a floor space of 20,000 sq ft, and has been wired with the company's "Ashathene" thermoplastic insulated cable. It will provide additional facilities for the production of the company's television and radio aerials.

Courses in Industrial Technology

The Ministry of Education has drawn the attention of local education authorities, Regional Advisory Councils for Technical Education and Regional Academic Boards to the urgent need to expand the provision of the advanced short courses which enable scientists and technologists in industry to keep abreast of developments and new techniques, and has asked them to make a special survey of the need for advanced short courses so that local education authorities and universities may make additional provision. The Ministry has also arranged to keep a list of all courses and to send particulars of them to the Federation of British Industries and the National Union of Manufacturers, who will inform their constituent bodies. Employing organizations and individuals are also invited to make suggestions for courses, either to the appropriate Regional Advisory Council or direct to the Ministry.

Films in Industry

Industrialists, motion study engineers, research workers, training officers and trade union representatives from many countries will meet in London during September to discuss new ways of using films in industry. The occasion will be the seventh annual Congress of the International Scientific Film Association to be held at the Royal Festival Hall, London. An important part of the Congress will be the five industrial sessions, beginning 22nd September, which will cover the international use of films for industrial research, vocational guidance, training and welfare, and methods of simplifying work by the use of film. Speakers from several European countries will show examples of industrial uses of film, and discuss them with their "opposite numbers" in this country. Speakers will include research engineers, personnel officers, training specialists, motion study engineers and film makers. A certain number of



The new extension to the factory of Aerialite, Ltd.

guests will be admitted to these sessions although much of the Congress is confined to delegates from the countries taking part. Representatives from British industry who require further particulars should apply to Mr. J. Stewart Cook, general secretary, Scientific Film Association, 164, Shaftesbury Avenue, London, W.C.2.

Midlands Home Life Exhibition

The Leicester and East Midlands Home Life Exhibition opens on Wednesday next at the Granby Halls, Leicester, and will continue until 19th September. Many well-known manufacturers of electrical equipment will be represented including the English Electric Co., Ltd., the Electrical Equipment Co., the Midland Dynamo Co., the Midland Electric Co., J. Orton (Electricians), Ltd., the British Vacuum Cleaner & Engineering Co., Ltd., Hoover, Ltd., and Kenwood Electrics, Ltd. The East Midlands Electricity Board will also have a display.

Radio Servicing Certificate Examination

The Radio Trades Examination Board and the City and Guilds of London Institute have announced that for the 1953 Radio Servicing Certificate Examination 309 candidates attended, of which 126 qualified for the award of the certificate. This figure includes 30 candidates who passed the practical test having been referred last year; 87 candidates were successful in the written papers, but were referred in the practical test. The 1954 examination will be held on 4th and 6th May for the written papers and 15th May for the practical test. The closing date for entries is 1st February and regulations and forms of application may be obtained from the secretary, Radio Trades Examination Board, 9, Bedford Square, W.C.1.

Educational

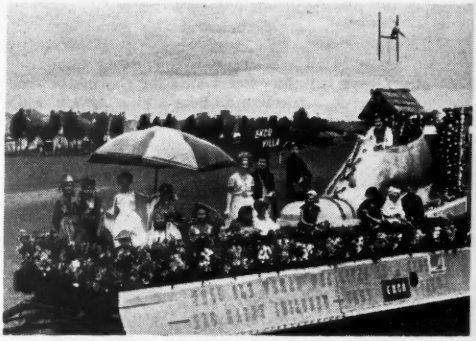
Evening courses in electrical engineering at the Polytechnic, Regent Street, W.1, commence on 28th September. The prospectus is obtainable on application to the Electrical Engineering Department.

The prospectus for the 1953–54 session at the Sir John Cass College, Jewry Street, Aldgate, E.C.3, is now available on application to the Principal.

Particulars of courses in electrical engineering and allied subjects which are being held during the 1953–54 session at the Northampton Polytechnic, St. John Street, London, E.C.1, are now available.

Carnival Tableau

At the Southend Carnival procession held last month, E. K. Cole, Ltd., entered a decorated vehicle which portrayed a modernized version of the nursery rhyme "The old woman who lived in a shoe." This showed that the occupants of



The Ekco entry in the recent Southend Carnival procession

the residence could be happy and contented with "Ekcovision."

Public Ownership in Sweden

The question whether the present organization of publicly-owned businesses and industries is in every case the most practical and efficient, has lately been discussed a good deal. The Swedish Government has now appointed a committee to study and report on the problem. In the directives for the committee the Minister of Finance said (as reported by the *Anglo-Swedish Review*):

> "When the suitable form of organization for a public enterprise is discussed, two sides of its activities have to be considered: it has to serve the nation, and it has to be economically sound. It does not seem likely that a standardized kind of organization suitable for all public undertakings can be found. In some cases the present form, i.e., State corporation under a governmental board seems to be the most suitable, but in other cases it would appear possible to use the limited-company organization. The committee will have to weigh the advantages of corporation and limited company against each other, and also consider whether some other type of public enterprise could not be used. In the first place they will have to study the question how far reforms within the framework of the present organizations may be required and would advance efficiency. They also will have to consider whether it might be desirable to give the corporation boards more authority and freedom of action."

Crompton Batteries

Traction, commercial and car starter batteries manufactured by Crompton Parkinson, Ltd., are now marketed under the brand name "Crompton," thus superseding the name "Young" which has been used since the Young Accumulator Co., Ltd., began manufacturing in 1927. The change of name, and a new

" Crompton " car starter battery, are being announced by an extensive advertising campaign in the national and trade Press, with full colour posters on main road sites throughout Great Britain. Sales aids for the motor trade include attractive leaflets and a device which will help to give better forecourt and filling service.

Egyptian Contract for Germany

Among contracts placed by the Egyptian authorities with Western German concerns, reports the Bonn correspondent of the *Financial Times*, is one for the electrification of the Cairo-Helwan railway (15 miles; 1,500 V d.c.).

P.O.A. Conference

The national conference and " Minibition " of the Purchasing Officers' Association will be held from 24th to 27th September at the Hotel Metropole and the Grand Hotel, Brighton.

Cost Accountants' Summer School

The Institute of Cost and Works Accountants' fourth residential summer school will be held this year at St. Catharine's College, Cambridge, from 21st to 26th September.

Changes of Address

The southern area office of the Electrical Power Engineers' Association is now at 80, Bulmershe Road, Reading (telephone: Reading 61974).

The address of the Fire Protection Association is now 15, Queen Street, London, E.C.4 (telephone: Central 4642).

Change of Name

Fred Marshall & Co. (Electricians), Ltd., Ilkley, Yorks, have changed their name to Arthur English (Ilkley), Ltd.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £150 0s 0d
COPPER, H.C. Electro	ton £228 0s 0d
Fire Refined 99·70 per cent ..	ton £227 0s 0d
Fire Refined 99·50 per cent ..	ton £226 0s 0d
COPPER Tubes	lb 2s 3½d
Sheet	ton £284 10s 0d
H.C. wire and strip	ton £258 15s 0d
LEAD, English	ton £96 0s 0d
Foreign	ton £95 0s 0d
MERCURY	flask £70 10s 0d
TIN	ton £612 0s 0d
ZINC, G.O.B. Foreign	ton £71 0s 0d
Electrolytic	ton £72 10s 0d
BRASS Tubes	lb 1s 8½d
Sheet	ton £232 5s 0d
Wire	lb 2s 4½d
PHOSPHOR BRONZE	
Wire	lb 3s 6½d
RUBBER, No. 1 R.S.S. spot ..	lb 19d–19½d

Trade Announcements

The Pollard Bearing Division and the Philidas Self-Locking Nut Division of **Ferrybridge Industries, Ltd.**, Ferrybridge, Yorks, have established a London office at 6, St. James's Place, London, S.W.1. (telephone : Hyde Park 9248-9). Mr. W. F. Clay, southern counties area manager, will be in charge of the London office, and Mr. T. S. Nethersole has been transferred from Ferrybridge to the London office to attend to all technical and sales matters in connection with the Philidas Division.

Ferranti, Ltd., announces the appointment of Mr. J. B. Browning, 11, Stratford Road, Hayes, Middx, and Mr. J. R. Talbot, Flat 3, " Wyberlye," Leylands Road, Burgess Hill, Sussex, to its radio and television sales force. Mr. Browning will be responsible for an area comprising Berks, Bucks, Hunts, Northants, Oxon and Wilts, whilst Mr. Talbot will be responsible for an area comprising Hants, Surrey, Sussex and the Isle of Wight.

Sturdy Electric Co., Ltd., Burnopfield, Newcastle-upon-Tyne, announces that it has increased its range of transformers, hitherto manufactured in sizes up to 50 kVA, to 100 kVA.

The **Stearn Electric Co., Ltd.**, has opened new premises at 9, Friday Street, Deansgate, Manchester.

Catalogues and Lists

Hugh Prichard & Co., Alice Square, Old Basford, Nottingham.—Two brochures illustrating " Sheen " unspillable compound buckets and portable furnaces, with price list.

Dale Electric (Yorkshire), Ltd., Electricity Buildings, Filey, Yorks.—Illustrated technical leaflet describing a 1,250 W a.c. diesel generating set.

Turbine Gears, Ltd., Cheadle Heath, Stockport, Cheshire.—66-page catalogue illustrating the company's range of double helical gears including a technical information section.

G. A. Stanley Palmer, Maxwell House, Arundel Street, Strand, London, W.C.2.—Leaflets on the " Winkler " precision multiway switch (O/GE.300) and " Constanta " high stability resistors (O/GE.162).

John Morris Electrical Engineering Co., Ltd., Market Street, Bilston, Staffs.—Illustrated folder covering a range of solenoid operated control relays (CR150453).

Standard Telephones & Cables, Ltd., Connaught House, Aldwych, London, W.C.2.—Two technical leaflets dealing with the 4033-A cardioid microphone (C/PA14) and 4032-C hand microphone (C/PA16).

ELECTRICITY SUPPLY

Manx Electricity Finances

Loans for South African Development

COMMENTING on the accounts of the Douglas Corporation Electricity Department, the borough treasurer says that only by crediting non-recurrent income of £12,869 was the reserve fund enabled to meet the loss of £17,563 on the year's working and the credit balance of the fund has now dwindled to a mere £944. Income has not expanded to the extent hoped for, while much of the reduction in costs attributable to the efficiency of the new plant has been offset by the substantial increase in the cost of coal. Loan charges, too, were higher and will be much more so for the current year now that the powers of suspension of sinking fund payments have lapsed in the case of short-term borrowings. Efforts to stabilize charges for electricity in the face of rising costs will be nullified unless the wide gap between the present load and the potential of the station is closed much more rapidly than is indicated by the rate of development in the past two years. Some more economical method of employing the plant is the alternative.

A deficit of £7,578 is shown in the annual report of the Isle of Man Electricity Board for the year ended 31st March last. The Board's tariffs have been revised to rectify the position in future.

Erecting Poles for Overhead Lines

The accompanying picture shows a Morris-Commercial MRA vehicle which is being used by the Norfolk Sub-Area of the Eastern Electricity Board for the erection of overhead lines. It is equipped to drill holes up to 20in diameter, 10ft deep, in less than three minutes, and will set poles 40 to 45 ft in length.

A Morris-Commercial MRA vehicle used for erecting poles for overhead lines

Savings Through "All-Electric" Policy

Speaking on the occasion of the switching-on of Clydebank's Overtoun Park illuminations (performed by his wife) Mr. J. Gogan, chief commercial officer of the South West Scotland Electricity Board, commended the town on its progressiveness and thrift. He said that years ago the Council had set out to make the town "all-electric." About £8 per house had been saved as a result, which meant £40,000 on approximately 5,000 houses. If Clydebank's example were followed there would be a national saving of £2,500,000 annually at the present rate of house building.

Greenhouse Heating Costs

The Birmingham Horticultural Branch of the National Farmers' Union has asked its parent body to see what can be done to obtain cheaper electricity for heating greenhouses and frames. The proposal is that the price of electricity used at night, when the normal demand is lightest, should be reduced if possible to ½d/kWh. If this were done many greenhouses could be heated with electricity instead of by coke or oil. Mr. Emil Braathen, Birmingham Sub-Area manager of the Midlands Electricity Board, said it was impossible to sell electricity at ½d/kWh, which would mean supplying it at a loss.

School Lighting

Northumberland Education Committee's proposal to spend £2,505 on installing electric lighting in nine schools during the current year has been approved by the County Council.

Farm Tariffs

Complaint that the Merseyside and North Wales Electricity Board was giving farmers preferential treatment at the expense of other consumers of electricity was made at the August meeting of the Consultative Council held at Chester. The meeting approved the new tariffs for farms which the Board proposes to introduce on 1st November and which will affect between 8,000 and 9,000 farms in Lancashire, Cheshire and North Wales. A suggestion that the

Board should be asked to reconsider its proposals was defeated. In the discussion Mr. D. Crabbe (Dunlop Rubber Co., Speke) said the figures provided by the Board showed considerable disparity between the charges to industry and farms, and Ald. S. Mahon (Bootle) said industrialists failed to see why farmers should be given preferential treatment. Mr. W. Gilchrist, chief commercial officer to the Board, denied that farmers were getting preferential treatment under the new tariffs. These tariffs were the highest that had been imposed by any Board in the country for farms, and many farmers were complaining that they were too high. On the new rate an increase in revenue of £45,000 a year was expected.

Tariffs for Bakers

It was stated at a meeting of the North Eastern Gas Consultative Council in Leeds that the Bradford and District Association of the Baking Industry had decided to recommend its members to switch over from gas and electricity to oil for heating their ovens. The Association recently wrote to the Gas and Electricity Boards in the area asking for tariff concessions. The Yorkshire Electricity Board replied suggesting discussions between representatives of the Association and the Bradford district manager. The deputy chairman of the North Eastern Gas Board said that the Board was concerned about the difficulty and discussions were taking place, but he could not see how any change could be made in the tariff.

Easy Payment of Accounts

At a meeting of the Yorkshire Electricity Consultative Council in Leeds last week it was announced that easy payment boxes were shortly to be made available for those consumers requiring them. The boxes would be taken to service centres at the end of each quarter in payment of electricity accounts. Ald. W. Leach, chairman of the Council, described the scheme as an attempt to relieve hardship. It was stated that the present system in Leeds where meter collectors opened the boxes would remain unchanged.

Mr. D. Bellamy, chairman of the Board, said the Board felt satisfied that the easy payment box method had great advantages over the stamp system. He added that 251,000 domestic consumers in the Area already had easy payment facilities. During the past twelve months 12,800 requests had been received for the replacement of prepayment meters by ordinary meters, while only 7,000 wanted prepayment meters. The simple answer was the proposed money-box, the prepayment meter being very much more expensive.

Rural Supplies not "Subsidized"

At the same meeting, in reply to a question by Councillor W. Fox (Louth), Mr. Bellamy said that the wording of a recent progress report issued by the Board which referred to electrification in rural areas as being "subsidized" by urban areas was unfortunate. As far as the Board was concerned electricity was supplied at an average price throughout the Area. He also pointed out that if the Board completed the whole of its rural development programme and found the necessary capital for it, the additional charge to consumers would only be about 0·004d/kWh.

Nationalization of Rangoon Undertaking

The British-owned Rangoon Electric Tramway and Supply Co., Ltd., received a formal notification that the long-expected nationalization will come into effect as from 1st October. No decision has been made on the procedure for taking over, nor on the difficult question of calculating compensation. The Government has indicated, however, that as the process of taking over will be very slow, it hopes that the company will continue with its normal practice and policy and avoid any changes to existing programmes. The British technicians are understood to have agreed to stay after nationalization.

Loans for South Africa

It was announced by the International Bank last week that it had made two loans of $30 million to the Union of South Africa, one for the development of electricity supply and the other for railway expansion. The electricity loan is the second made by the Bank; a similar amount was lent in 1951. The funds are needed by South Africa to enable it to proceed with its programme of power station and transmission line construction and the money will be used to pay for structural work, boilers, generating plant, transformers, switchgear and cables.

Pakistan Power Schemes

The Siddhirganj thermal power station in Pakistan, the foundation stone of which was laid on 21st June, will supply the initial demand of the growing industries in that area. Its initial capacity will be 18 MW, but it will later on be extended by 30 MW. In due course this station will be linked with the existing Dacca and Dhakeswari power stations. The Coalpara thermal power station is expected to be in operation by June, 1954. This scheme will meet the electricity requirements of industries at Khulna and the Chalna port and the Government of East Pakistan is spending about Rs. 70 lakhs on the erection of the station. Work on the coffer dams at the Kharnafuli hydro-electric project has ceased and no further construction will be undertaken until the cold weather season. Invitations to tender for the electrical equipment are expected to be issued towards the end of this year.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

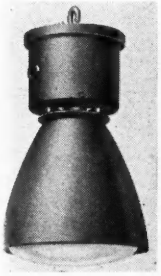
Waxed Enamelled Strands

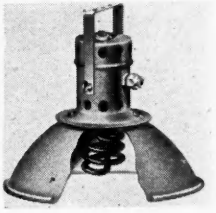
THE waxed enamelled strands made by the CONCORDIA ELECTRIC WIRE & CABLE CO., LTD., Long Eaton, Nottingham, can be used without further covering for wave winding r.f. coils. The object of this development was to produce a suitable " Litz " wire at a reduced cost. This appears to have been achieved since a comparison of the price of 5/46 enamelled and single rayon covered and 5/46 enamelled and waxed strands shows a saving of about 6s a lb. For other sizes the saving will be proportionate.

Infra-red Units for Farms

In addition to the two-lamp reflector fitting already produced, the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, has introduced two new infra-red heating units for pigs, poultry and other farm stock, comprising a 250 W single-lamp unit and a 300 W dull-emitter unit.

The single lamp heater incorporates a 250 W 200/260 V " Osram " infra-red reflector lamp. The interior of the upper part of the bulb is silvered to reflect the heat downwards, and the end of the bulb is lightly obscured to diffuse the heat. The cap is attached to the bulb by mechanical means to ensure that it does not become loose under arduous service conditions, and the brass shoulder ring is electrically insulated from the cap to prevent accidental contact with live metal. The lamp is housed in a sheet steel shroud to protect it from mechanical damage and from dripping moisture, and the lampholder and connections are adequately shielded to prevent accidental contact.





G.E.C. 250 W single-lamp and 300 W dull-emitter infra-red heaters

The dull-emitter unit has a metal-sheathed wire element which is practically unbreakable. The heater is mounted in a substantial aluminium reflector and all live metal parts are amply protected. The price of the single-lamp infra-red heater is £2 2s, and of the 300 W dull-emitter infra-red heater £3 16s 6d.

Mercury Fluorescent Lamps

Modifications have been made to the range of MBF/V and 125 W mercury fluorescent lamps made by PHILIPS ELECTRICAL, LTD., Century House, Shaftesbury Avenue, London, W.C.2. The bulbs of the new lamps are the same size as those of the existing mercury types MB/V, and give a much improved colour rendering making them suitable for Class B street lighting. The prices are the same as for the present lamps: 80 W 48s 6d, and 125 W 59s.

Low Speed Gear Unit

A low speed worm-spur gear unit recently introduced by HIGGS MOTORS, LTD., Witton, Birmingham, has an output of 100 lb/ft between 1·1 and 15 r.p.m. and it can be supplied suitable for operation on single- or three-phase supplies. The ball bearing motor complies with B.S. 170 : 1939, and is of the drip-proof pattern, but if required a totally enclosed motor can be incorporated.

The gearbox houses both primary worm reduction and secondary spur reduction and is made to eliminate oil leakage. The gears, carried between ball bearings, are completely enclosed and run in oil, a distinctive feature being that the motor shaft protrudes through the worm and is supported by a third bearing housed in the gearbox.

Higgs low speed worm-spur gear unit

LAMP PUBLICITY

Manufacturers' Plans for the 1953-54 *Lighting Season*

THE new campaign for "Metrovick" lamps will again feature the slogan "Best light in the world, daylight—When daylight fades, Metrovick lamps." To illustrate this slogan cut-outs, showcards and window displays will be available to the trade on request. The two-plane cut-out unit standing approximately 30in high and 24in wide, is printed in eleven colours. The showcard, printed in ten colours, measures 19in by 13in. Self-packing portmanteau type window features embodying new displays and standing approximately 3ft 6in high are again available. These can be used as single units for the smaller windows or as part of the larger window display; alternatively, up to four units can be arranged as a composite display.

A new edition of the lamp catalogue will be available with a completely revised internal layout for speedy reference. An innovation is the use of "Dayglo" fluorescent ink on the cover. A new edition of the handy pin-up folder will be available with ready reference to prices and purchase tax. On 1st October a new lamp calendar will be issued.

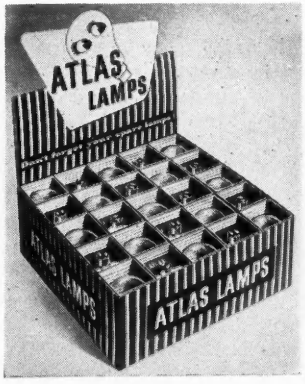
The advantages of fluorescent lighting are exemplified in the range of "Metrovick" fluorescent fittings illustrated in an attractive broadsheet now issued providing full price information and details of purchase tax where applicable in handy pin-up form. There is a new inexpensive batten fitting for one 5ft 80 W fluorescent lamp for which an attractive hand-out leaflet is in stock. A new catalogue of industrial lighting fittings for tungsten and electric discharge lamps is available which will be supplemented by a catalogue of commercial lighting equipment in the autumn.

Red and yellow candy stripes form a gay background to the blue and white design of a new "Atlas" lamp counter display issued by Thorn Electrical Industries, Ltd. Serving as a reminder that spare lamps, so often forgotten, are always necessary in the home, the new pack carries the top layer in each carton of fifty 100 W lamps. It can therefore be lifted from the pack into immediate service on the counter. The company has issued a broadsheet to the trade giving particulars of the new display pack and of its poster advertising campaign.

Ekco-Ensign Electric, Ltd., has planned a new programme for the coming lighting season based on a greatly expanded range of industrial, commercial and decorative fluorescent lighting fittings. A wider range of industrial and commercial fittings for use with Ekco tungsten lamps will also be available. In addition, the range of tungsten filament lamps has been increased and includes the new improved Ekco white lamp with an internal silica coating, giving maximum diffusion with minimum loss of light.

The publicity includes a new pocket-size comprehensive fluorescent and tungsten fittings catalogue, together with colourful broadsheets and leaflets. New sales aids include coloured showcards, together with a display carton

Left: **New "Metrovick" showcard**



Right: **Thorn counter display**

Left: **A new Crompton full-colour showcard**

Right: **"Mazda" window display**

holding up to twelve tungsten lamps of various sizes. The showcards, made to the convenient size of 12in by 8in, are suitable for window and counter display. A correspondence sticker of similar design and colour scheme has also been produced.

The lamp advertising campaign to be undertaken by Crompton Parkinson, Ltd., is a comprehensive scheme planned to cover all sections of the lamp market, and includes a special appeal feature in a number of the popular women's journals. In all advertising the "Switch to Crompton lamps" slogan has been changed to "Switch to Crompton lamps—for life." Following the success of previous poster campaigns there will be an extended scheme with a bold new poster in full colours.

A new version of the Crompton lamp cartoon film will be shown in some 500 of the leading cinemas during the coming autumn and winter. Advertising material includes a new full-colour showcard of novel design and attractive finish. Literature includes a lamp price list, counter leaflets and the "Crompton Sales Assistant's Own Reference Book," which gives prices and essential information required by the salesman. A larger and improved design of the Crompton hanging price card will be available for general distribution. For Crompton automobile lamp retailers a combined price list and wall chart will be available. A retailer's price card is to be provided for Crompton cycle lamp publicity.

"Kye" lamp sales will be supported by an effectively designed showcard, an easy-reference hanging price card, and a new counter leaflet of attractive design.

Two new "Mazda" window dressing displays, which may be booked in advance, are available from the British Thomson-Houston Co., Ltd. Each is based on a centrepiece which initially can only be supplied when a window is professionally dressed by arrangement with the company. The centrepiece on which the two displays are based consists of a transformation scene controlled by a flasher, which shows a man awakened by ghosts, captioned "At night imagination's stronger . . . but Mazda lamps stay brighter longer" and a cut-out of a woman sewing by the light of a correctly situated "Mazda" lamp. Both window displays draw attention to the booklet "Lighting to Measure" which contains a new approach to lighting in the home.

Applications for the complete dressing of a window or for the supply of individual items of the displays, including pelmets, but excluding centrepieces, should be made to the Advertising Department, British Thomson-Houston Co., Ltd., 18, Bedford Square, London, W.C.1. Window dimensions should be stated. The window dressings will be carried out by Window Dressing Services, Ltd.

Ekco-Ensign showcard

New E.I.B.A. Branch

A NEW Branch of the Electrical Industries Benevolent Association is being formed for the North Metropolitan area. The inaugural meeting is arranged for 14th September at the Eastern Electricity Board's offices, Station Road, Wood Green, at 2.30 p.m. All members of the Association in this area are invited to be present. The area covers districts in the north of London, Hertfordshire and West Middlesex, and includes Wembley, Enfield, Hendon, Harrow, extending to Hoddesdon, St. Albans and Letchworth.

Financial Section

STOCKS and SHARES

DESPITE the appearance of some hesitancy in its last week, August was on the whole a surprisingly good month for most sections of the Stock Exchange. Gilt-edged stocks made upward progress but industrials, generally, led the way. Within a month of the signing of the Korean truce, the market in electrical and engineering shares, for instance, was able to record useful advances of about 2s 6d to 3s in the prices of such shares as A.E.I., Automatic Telephone, Babcocks, Brook Motors, London Electric Wire, Chloride Electrical, C. A. Parsons, Reyrolles, Tube Investments and Westinghouse Brake. The "radio" group was distinguished by improvements in E.M.I., Decca and others.

Further Outlook

In any ordinary course of events, the establishment of an upward trend of prices in the traditionally slack investment season could be expected to provide the momentum for further progress during the autumn. These are not the days, however, in which logic is a particularly reliable guide to the sequence of events in the investment field. The engineering wages problem and reports of increasingly competitive export conditions in many branches of the industry concerned, make for uncertainty in home affairs. External events have also given sharp reminders of their influence. Markets nevertheless started the present month in good form, and clearly in a mood to respond to encouragement.

Richardsons Westgarth Report

Full accounts published by Richardsons Westgarth & Co. confirm an expansion of the net profit by more than a third in the year to last March, on the strength of which the ordinary dividend is being raised from 12 to 15 per cent. With the bulk of the surplus again retained in the business, the balance sheet now shows capital and revenue reserves well in excess of the £1,327,000 capital, which is all in ordinary stock. At 10s 6d the 5s units give a return of rather more than 7 per cent on the latest distribution. In his report the chairman expresses concern over the falling-off in orders for the shipbuilding industry.

Preference Dividend Raised

H. J. Baldwin & Co.'s plans for raising new capital involve the unusual proposal for an increase in the rate of dividend on the preference shares from 6 to 7 per cent. This step is connected with the board's intention to make an offer of the unissued shares, when expedient, to both the ordinary and preference shareholders by way of rights. The announcement accompanies the declaration of a final dividend which again makes 20 per cent for the year, and a preliminary profits statement showing a further increase in the net surplus to £29,500. The price of the 2s shares eased off to 4s; the preference were made about 18s nominal, compared with 17s previously.

Sterling Cable Earnings

The Sterling Cable Co., being a subsidiary of A. C. Cossor, public participation in the shares is confined to the 4½ per cent preference, which are quoted at about 18s and have the distinction of a fixed date for repayment. At the same time, the good results published last week are of interest for the group of cable manufacturers' shares as a whole, and not only from the point of view of the 25 per cent expansion of trading profits. Another main feature of the report is the large improvement in the cash position as witnessed by the disappearance of last year's £79,000 overdraft, and the rise in cash balances from £4,000 to £109,000.

Financial Relief

The strengthening of Sterling Cable's cash resources, referred to above, is the result, according to the report, of the greater availability of raw materials, which made possible a reduction of as much as £200,000 in the sums tied up in stocks and work. Relief in this form from the financial stresses of previous years is becoming thankfully common in this year's company news. It is thought to be the principal explanation of a phenomenon which has attracted some attention this year, namely, a tendency to relax a little the austerity of dividend policies in the face of a general decline in company earnings.

The Week's Changes

Crompton Parkinsons have again been one of the favoured shares in the electrical equipment market, rising 1s further to 12s in anticipation of the final dividend and results due within a month or two. Strand Electric Holdings were quoted at 7s 9d after news of the maintenance of the dividend at 17½ per cent, and on that basis show an 11¼ per cent yield. Watford Electric shares changed hands at over 8s after confirmation of the proposed capital bonus. Other shares to improve included Ever Ready, Johnson & Phillips, and Laurence Scott.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 31st Aug. 1953	Week's Rise or Fall	Est. Yield £	Est. Yield s	Est. Yield d
Gilt-edged and Overseas Stocks							
Brit. Elec. 1968/73	3	3	87xd	—	3	9	0
Brit. Elec. 1974/77	3	3	86	—	3	9	0
Brit. Elec. 1976/79	3½	3½	93	—	3	15	3
Brit. Elec. 1974/79	4½	4½	101xd	+⅜	4	4	2
Calcutta Elec. ..	6†	6†	20/-	—	6	0	0†
East African Power	7	7	24/6	—	5	14	3
Nigerian Elec. ..	10	10	24/-	—	8	6	8
Palestine Elec. "A"	5†	Nil	15/-	+⅛		Nil	
Perak Hydro-Elec.	Nil	Nil	17/6	—		Nil	
Equipment and Manufacturing							
AberdareCables(5/-)	20	25	16/3	+3d	7	13	9
Aerialite (1/-) ..	83½	88½	8/9	—	10	1	10
Allen, W. H. ..	15	15	45/9	—	6	11	3
Aron Elec. Ord. ..	15	20	42/6	—	9	8	2
Assoc. Elec. Ord. ..	20	20	78/6	—	5	1	6
Automatic Tel. & El.	15	15	58/9	—	5	2	0
Babcock & Wilcox	18	18	66/6	—	5	8	5
Baldwin, H. J. (2/-)	20	20	4/-	−3d	10	0	0
Bakelite (10/-) ..	—	12½	19/-	—	6	11	6
British Aluminium	12	12	41/-	—	5	17	0
B.I. Callender's ..	9	10	37/-	—	5	8	1
British Thermostat (5/-)	30	35	16/3	—		—	
British Vac. Cleaner (5/-)	25	25	12/3	+3d	10	4	0
Brook Motors (10/-)	20	20	37/6	+3/9	5	6	8
Brush Ord. (5/-) ..	10	4	4/-	−3d		—	
A. F. Bulgin (1/-)	30	30	2/9	—	10	18	0
Burco (5/-) ..	38¾	35	18/3	—	9	13	0
Chloride El. Storage	15	20	78/9	—	5	1	0
Cole, E. K. (5/-) ..	25	25*	19/9	—	6	6	7
Cossor, A. C. (5/-)	Nil	10	10/-	—	5	0	0
Crabtree (10/-) ..	17½	17½	29/-	—	6	0	8
Crompton Parkinson Ord. (5/-) ..	11½	11½	12/-	+1/-	4	13	9
De La Rue (5/-) ..	35	Nil	8/6	−3d		—	
Decca (5/-) ..	112½	150	27/6	−1/-	5	9	0*
Dewhurst (2/-) ..	22½	19*	5/6	—	6	18	3
Dictograph Tel.(2/-)	20	20	5/6	—		—	
E.M.I. (10/-) ..	12	12	14/6	−3d	8	5	6
Electrical Components (5/-) ..	20	20	10/-	—	10	0	0
Elec. Construction	15	15	52/6	—	5	14	3
Enfield Cable Ord.	7½	5	21/3	—	4	14	0
English Electric ..	15	15	52/6	—	5	14	3
Ericsson Tel. (5/-)	22†	22*†	38/6	—	2	17	6†
Ever Ready (5/-)	35	35	26/-	+6d	6	14	6
Falk Stadelmann	15	15	41/9	+3d	7	3	9
G.E.C. Ord.	22½	11½*	38/9	—	5	18	2
General Cables (5/-)	30	30	16/3	—	9	4	8
Greenwood & Batley	15	17½	40/-	—	8	15	0
Hackbridge Cable (5/-)	20	20	12/3	—	8	3	4
Hackbridge Hewittic (5/-)	20	20	17/6	—	5	14	2
Hall Tel. Acc.(10/-)	10	10	10/-	—	10	0	0
Hearnse (2/-) ..	12½	12½	4/-	—	6	5	0
Henleys (10/-) ..	20	10½*	17/6	+3d	6	0	0
Holophane (5/-) ..	15	20*	12/6	—	8	0	0
Hoover (5/-) ..	35	25	25/3	+6d	4	19	0
Equipment and Manufacturing (continued)							
Intl. Combustion (5/-)	25	15*	13/9	—	5	9	0
Johnson & Phillips	15	15	53/-	+6d	5	13	2
Lancashire Dynamo	12½	12½*	42/6	—	5	17	8
Laurence, Scott(5/-)	15	15	12/9	+6d	5	17	8
London Elec. Wire	12½	15	60/9	—	4	18	8
J. Lucas	7½	9½	41/3	—	4	8	10
Marryat & S. (2/-)	22½	22½	5/9	—	7	16	6
Mather & Platt ..	12½	15	50/-	—	6	0	0
Metal Industries ..	15	12*	40/3	—	5	19	5
Mid. Elec. Mfg. ..	15	15	58/3	—	5	2	9
Murex	15	15	55/-	−3d	5	9	0
Newman Ind. (2/-)	10	10	2/3	—	8	17	9
Oldham & Son (1/-)	35	17½*	2/6	—	7	0	0
Parnall (Yate) (5/-)	6	6	3/10½	−1½d	7	14	10
Parsons, C. A. ..	10*	12½	70/-	−⅛	3	11	5
Plessey (5/-) ..	22½	25	26/3	—	4	15	3
Pye Deferred (5/-)	18	20	19/-	—	5	5	3
Revo (10/-) ..	27½	27½	16/3	—		—	
Reyrolle	10*	12½	62/6	+⅛	4	0	0
Scot. Cable (4/-) ..	32	20*	12/9	—	6	5	6
Siemens Ord. ..	10	10	35/6	+6d	5	12	8
Southern Areas ..	5	6	14/9	—	8	2	8
Strand Elec.(5/-) ..	17½	17½	7/9	−6d	11	5	10
Sturtevant (5/-) ..	17½†	18·1*†	25/-	—	3	12	0
Switchgear & Cowans (5/-)	22½	22½	14/-	—	8	0	9
Taylor, T. (5/-) ..	20	25	20/-	—	6	5	0
T.C.C. (10/-) ..	20	20*	37/-	—		—	
T.C. & M.	10	8½*	29/-	—	5	17	3
Telephone Mfg.(5/-)	10	10	7/6	—	6	13	4
Thorn. Elec. (5/-)	10	12½	11/3	—	5	11	1
Tube Investments	25	15*	61/-	+3d	4	18	4
Vactric (5/-) ..	Nil	Nil	7/6	—		Nil	
Veritys (5/-) ..	7½	10	4/6	—	11	2	2
Walsall Conduits (4/-)	70	70*	44/6	—	6	5	10
Ward & Goldstone (5/-)	45	45*	39/-	—	5	15	9
Watford (2/-) ..	25	25	8/-	+3d	6	5	0
Westinghouse Brake	14	15	57/6	—	5	4	2
West, Allen (5/-) ..	15	15	12/-	+6d	6	5	0
Trusts, Transport and Communications							
Anglo-Am. Tel.: A Ord.	—	6	84½	—	7	2	0
Ord.	—	3¾	57½	—	6	10	5
Anglo-Portuguese	8	8	21/3	—	7	10	7
Brit. Elec. Traction: Def. Ord. (5/-) ..	25	35	29/-	+6d	6	0	8
Cable & Wireless: Ord.	8	8	134	+1	5	19	6
4% Loan ..	4	4	97	—	4	2	6
Calcutta Trams ..	6†	6†	20/-	—	6	0	0†
Cape Elec. Trams	5	5½	10/6	—	10	9	6
Marconi Marine ..	10	10	28/6	—	7	0	4
Oriental Tel. Ord.	16	16	70/6	—		—	
Telephone Props.	8	8	5½	−½		—	
Tele. Rentals (5/-)	10	10*	9/3	+3d	5	8	1

* After capital bonus. † Dividends are paid free of income tax.

The above quotations are based upon the middle prices given in the Stock Exchange Daily Official List

REPORTS and DIVIDENDS

Brook Motors, Ltd., announces that, the consent of the Treasury having been received, it is proposed that the sum of £71,335 10s, part of the sum standing to the credit of the capital reserve, be capitalized and applied in paying up in full 142,671 ordinary shares of 10s each to be allotted to ordinary shareholders in the proportion of one new share for every six ordinary shares held. An extraordinary general meeting to consider the proposal will be held on 29th September. The new shares will rank *pari passu* in all respects with the existing ordinary shares and will, therefore, entitle holders to any final dividend declared in respect of the year ending 30th September next. The directors expect to be able to recommend the payment of a final dividend of 15 per cent (same) on the increased capital.

The Palestine Electric Corporation, Ltd.—The Tel Aviv Correspondent of the *Financial Times* reports that the Israel Government has entered into a "fifty-fifty" partnership with the Corporation. The statement was made during the debate on the final reading of the development budget for the period from July, 1953, to March, 1954. The budget earmarks I.£6,900,000 for the development of electricity production. Under the preliminary agreement, a 6 per cent tax free dividend, payable in sterling, is promised by the Government to present shareholders. The Government is to appoint five of the ten members of the new board of directors to be formed in Israel parallel to the board in London. The agreement will be discussed at a general meeting of the company to be held in London this month.

The Sterling Cable Co., Ltd.—The accounts for the year ended 31st March last show a group trading profit of £162,513, as compared with £127,303 for the preceding year, and after charging depreciation of £21,262, etc., the group net profit, before taxation, is £125,029 (£87,682). Taxation absorbs £83,920, and it is proposed to pay a dividend for the year of 10 per cent (same), and a bonus of 5 per cent (against 2½ per cent).

The Rheostatic Co., Ltd., is offering 80,000 new 6 per cent cumulative preference shares of 10s each to existing preference holders at par in the proportion of four shares for every eleven held, and 175.000 new ordinary shares of 4s each at 8s a share to ordinary shareholders on the basis of five for every twenty-eight held. Treasury consent has been obtained.

A. C. Cossor & Co., Ltd., will submit a resolution at the forthcoming annual meeting on 23rd September for the creation of a further 2,500,000 ordinary shares of 5s each. It is intended to take the first available opportunity to issue "at least part" of this new capital. It is not possible yet to say how many shares will be issued, or at what price, but ordinary shareholders will be offered prior rights to subscribe.

The West London & Provincial Electric & General Trust, Ltd., has declared an interim dividend of 4 per cent (against 3 per cent). The increase is to reduce the disparity with the final dividend. The total distribution last year was 10 per cent.

Strand Electric Holdings, Ltd., reports a net consolidated profit for the year to 30th April last, after deducting taxation, of £20,938, as compared with £24,407 for 1951-52. The dividend for the year is maintained at 17½ per cent.

Cable & Wireless (Holding), Ltd., has declared an interim ordinary dividend of 3 per cent.

Walsall Conduits, Ltd., has declared an interim dividend of 20 per cent (unchanged).

New Companies

Klerecep, Ltd.—Registered 11th August. Capital £100. Electrical engineers and contractors, manufacturers and dealers in radio apparatus, etc. Directors: S. Trup and J. Trup. Regd. office: Argyle House, 29/31, Euston Road, N.W.1.

Y.L.D. Products, Ltd.—Registered 12th August. Capital £600. To establish and carry on, in Yorkshire, Lincolnshire and Durham and elsewhere, an agency or agencies for the sale of patent flexible piping for use in the electrical industry, etc. Directors: A. Myers, D. W. Brookes, D. E. Myers and J. T. Tallent. Secretary: Douglas E. Myers. Regd. office: 99/101, Wolseley Road, Sheffield, 8.

Liquidation

The Green Electrical & Engineering Co., Ltd.—Particulars of claims by 26th September to the liquidator, Mr. H. C. Bakes, 12, Dingle Road, Gledholt, Huddersfield.

Bankruptcy

H. W. Sharp, 178, Osmaston Road, Derby, carrying on business as "Willdays," electrical and radio engineer.—First and final dividend of 9s 10½d in the £ payable on and after 15th September, at the office of the trustee, Latham & Co., Walter House, 418-422, Strand, London, W.C.2.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 14th October, from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

3479. National Research Development Corporation.—Luminous discharge tubes. 24th April, 1950. (698403.)

5888. Radio Corporation of America.—Formation of films on granular fluorescent screens. 3rd March, 1949. (698404.)

9936. Andre, H. G.—Electric accumulators. 12th April, 1949. (698405.)

14326. Horstmann Clifford Magnetics, Ltd., and Clifford, C. F.—Magnetic escapement mechanism. 17th May, 1950. (698406.)

26815. Crockatt & Sons, Ltd., W., and Crockatt, W. C.—Apparatus for electrically measuring the properties of liquids, the electrical conductivity of which varies with said properties. 20th October, 1950. (698237.)

28512. G.W.B. Electric Furnaces, Ltd.—Conveyors. 7th November, 1950. (698410.)

1950

3092. Flexible Lamps, Ltd., and Haver, G. L.—Electric lamps. 7th February, 1951. (698242.)

6651. Marconi's Wireless Telegraph Co., Ltd.—Radar systems. 7th February, 1951. (698412.)

6727. Philips Electrical Industries, Ltd.—Circuits for inverting the sense of variations of a voltage. 17th March, 1950. (698241.)

11059. Telefonaktiebolaget L. M. Ericsson.—Automatic telephone system comprising cross-bar switches and markers. 4th May, 1950. (698328.)

15132. Electronic Research & Manufacturing Corporation.—Apparatus for producing frequency modulation of electro-mechanical oscillators. 16th June, 1950. (698489.)

18382. Ericsson Telephones, Ltd., and Stevens, J. R. H.—Electrical remote signalling systems. 23rd July, 1951. (698335.)

21804. General Electric Co., Ltd., and Bowtell, J. N.—Electric discharge lamps. 4th September, 1951. (698421.)

27062. British Thomson-Houston Co., Ltd., Wild & Co., Ltd., M. B., Batty, A. W. H., and Liddiard, A. H. C., and McVeigh, E. M. C. (legal representatives of Liddiard, H. W. C., deceased).—Fluid-control valves. 27th September, 1951. (698497.)

27817. British Thomson-Houston Co., Ltd., and Wallis, S.—Systems of electric motor control. 14th November, 1951. (698267.)

28451. Bendix Aviation Corporation.—Automatic voltage control systems of dynamo-electric machines. 21st November, 1950. (698499.)

29137. British Insulated Callender's Cables, Ltd.—Extrusion of metals. 27th November, 1951. (698344.)

30074. Ranco, Inc.—Control mechanism for adjusting a pressure actuated control member, e.g., a valve or an electric switch. 8th December, 1950. (698504.)

1951

943. English Electric Valve Co., Ltd.—Thermionic cathodes for electronic-discharge devices. 26th October, 1951. (698429.)

967. Hoover, Ltd., and Camprubi, B. — Commutators for dynamo-electric machines. 31st December, 1951. (698508.)

2076. General Electric Co., Ltd., and Jones, H. F.—Electric surge divertor arrangements. 8th January, 1952. (698352.)

3123. Muirhead & Co., Ltd.—Electrical circuit arrangements for standard frequency sources. 5th February, 1952. (698278.)

3717. British Insulated Callender's Cables, Ltd.—Manufacture of electric cables. 14th February, 1952. (698434.)

3861. Bendix Aviation Corporation.—Overvoltage protective systems. 16th February, 1951. (698435.)

4688. Marconi's Wireless Telegraph Co., Ltd.—Filters and the like for use on very high frequencies. 28th November, 1951. (6985[illegible]9.)

6172. General Electric Co., Ltd., and Ferguson, H. H.—Lighting fittings. 12th March, 1952. (698355.)

6490. Harley, M. C.—Aircraft landing lamps. 18th March, 1952. (698356.)

6918. British Electrical & Allied Industries Research Association.—Direct current electric power transmission systems employing valve convertors. 12th March, 1952. (698438.)

7415. Standard Telephones & Cables, Ltd.—Heated cathode electron multiplier. 30th March, 1951. (698440.)

7477. Marconi's Wireless Telegraph Co., Ltd.—Thermionic valve protection circuit arrangements. 23rd October, 1951. (698283.)

7821. British Thomson-Houston Co., Ltd.—Preventing oil creepage in bearing assemblies. 4th April, 1951. (698284.)

8010. Record Electrical Co., Ltd., and Ainsworth, E. J.—Moving coil relays. 27th May, 1952. (698357.)

8432. British Insulated Callender's Cables, Ltd.—Recovering copper and tin from tinned copper. 10th April, 1952. (698285.)

10487. Electrolux, Ltd.—Means for supporting dust collecting bags of vacuum cleaners. 4th May, 1951. (698360.)

12320. British Thomson-Houston Co., Ltd.—Electric filament lamps. 6th March, 1952. (698465.)

17322. Cole, Ltd., E. K., Atkinson, N. T., and Baerselman, G. A.—Electric transformers. 18th July, 1952. (698519.)

17640. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 1st July, 1952. (698521.)

17806. Automatic Telephone & Electric Co., Ltd.—Driving mechanisms for automatic switches. 11th July, 1952. (698522.)

18431. English Electric Co., Ltd.—Electricity meters. 25th July, 1952. (698525.)

19018. Small Electric Motors, Ltd., and Stringer, H.—Heteropolar polyphase inductor alternators. 31st July, 1952. (698527.)

22049. Philips Electrical Industries, Ltd.—Television receiver circuit arrangement. 20th September, 1951. (698296.)

22377. Plessey Co., Ltd.—Potentiometers or resistor elements. 28th July, 1952. (698530.)

23116. Licencia Talalmanyokat Ertekesito Vallalat.—Jointing pieces for electric conductors. 4th October, 1951. (698381.)

23479 & 24112. Electro-Mécanique de l'Aveyron.—Electro-dynamic brakes. 9th and 16th October, 1951. (698478 & 698442.)

24762. Telefonaktiebolaget L. M. Ericsson.—Cross-bar switches for automatic telephone exchanges. 23rd October, 1951. (698383.)

25595. Stichting voor Fundamenteel Onderzoek der Materie, and Dijck, W. J. D. Van.—Method of and device for the generation of high-electric voltages. 1st November, 1951. (698447.)

26060. Babcock & Wilcox, Ltd.—Tubulous vapour generators. 7th November, 1951. (698304.)

26991. Marconi's Wireless Telegraph Co., Ltd.—Radar and other systems employing cathode-ray tubes. 23rd July, 1952. (698533.)

29566. Westinghouse Electric International Co.—Vapour electric arc-discharge devices. 18th December, 1951. (698449.)

29629. Machlett Laboratories, Inc.—X-ray tubes. 18th December, 1951. (698450.)

1952

731. Hanovia Chemical & Manufacturing Co.—Electrical discharge lamps. 9th January, 1952. (698452.)

1363. Westinghouse Electric International Co.—Rectifier powered equipments. 17th January, 1952. (698454.)

4739. Philips Electrical Industries, Ltd.—Devices for reproducing colour images and more particularly television receiving devices. 22nd February, 1952. (698512.)

7649. Philips Electrical Industries, Ltd.—Circuit arrangements for energizing relays. 25th March, 1952. (698538.)

8388. Philips Electrical Industries, Ltd.—Coils comprising a ferromagnetic core premagnetized by a permanent magnet. 2nd April, 1952. (698458.)

8645. Compagnie Auxiliaire des Mines.—Accumulator battery. 4th April, 1952. (698391.)

16239/40. Philips Electrical Industries, Ltd.—Superheterodyne receiving circuits. 27th June, 1952. (698396/7.)

16259. Kolster-Brandes, Ltd.—Radio receivers. 27th June, 1952. (698398.)

16447. Soc. Industrielle de Liaisons Electriques.—Armouring of electric cables. 30th June, 1952. (698460.)

17073. Soc. Alsacienne de Constructions Mecaniques.—Impedance bridges with a wide range of modulus and phase angle measurements. 7th July, 1952. (698320.)

TRADE MARKS

RECENT applications for the registration of trade marks include the following, objections against which may be entered up to 19th September:—

ASTRAL (design). No. 713,397, Class 6. Metal boxes included in Class 6.—Astral Switchgear, Ltd., Alma Road, Ponders End, Enfield, Middlesex.

K.L. (design). No. B 710,950, Class 9. Electrical apparatus, instruments and parts included in Class 9.—Key-Leather Co., Ltd., 5, Urswick Road, London, E.9.

XEROX. No. 710,962, Class 9. Electro-photographic copying machines and apparatus for fusing powder images on to paper in connection with these machines.—Haloid Co., Rochester, N.Y., U.S.A. Address for service, c/o Marks & Clerk, 57–58, Lincoln's Inn Fields, W.C.2.

CLAROSTAT. No. 712,968 and No. 713,522 (design), Class 9. Electrical resistances, switches and parts included in Class 9 and ion traps.—Clarostat Manufacturing Co., Dover, N.H., U.S.A. Address for service, c/o Marks & Clerk, 57–58, Lincoln's Inn Fields, London, W.C.2.

CHEETAH. No. 719,350, Class 9. Radio apparatus, radiograms, television apparatus, etc.—Hilton Nixon, Ltd., Terminus Chambers, 6, Holborn Viaduct, London, E.C.1.

ASHLEY (design). No. 719,164, Class 11. Electric lampholders and ceiling roses.—Ashley Accessories, Ltd., Morecambe Road, Ulverston, Lancs.

MAGNA-LITE. No. 716,478, Class 12. Electrically-operated traffic indicators, parts and fittings for motor road vehicles.—Magnatex, Ltd., Harlington Works, Bath Road, Harlington, Middx.

B.I. CALLENDER'S (design). No. 707,322, Class 17. Electric insulators and parts included in Class 17 and electric insulating materials for use in electricity transmission and distribution systems.—British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2.

DURASEAL. No. 715,470, Class 17. Jointing materials (in the nature of packing) made of non-metallic materials.—Duratube & Wire, Ltd., Faggs Road, Feltham, Middx.

LIGHTING NOTES

IN his 1952–53 report the LIVERPOOL city lighting engineer (Mr. C. C. Smith, A.M.I.E.E.) states that his Department's policy has been to concentrate on the restoration of side streets and passage lighting, but main traffic routes have also received attention and several major schemes have been completed and commissioned. The total number of metal filament electric lamps used during the year was 88,026, representing an average of 3·19 per holder per annum. The number of sodium tubes used was 4,320, an average of 1·29 per lamp per annum. The number of lamps now operated by remote or centralized control from 62 control points is 6,007. Of that number 4,300 are operated by individual units from 33 transmitters and 1,707 by 123 grouped units from 32 master switches.

ASHTON-UNDER-LYNE Lighting Committee planned two street lighting improvement schemes for 1953–54, one costing £4,000 in Stockport Road and the other £3,000 in Stamford Street. The Council decided that only one should be started during the present financial year. By using overhead distribution, however, it was found that the cost could be reduced to £2,400 and £2,590 respectively, and the Lighting Committee has now urged that the whole of the first scheme, and part of the second, up to a total cost of £4,000, should be started by making use of this method.

ENNERDALE (Cumberland) R.D.C. has accepted a revised scheme of £2,023 for an electric lighting scheme for Egremont main street. When the plan was first proposed it was opposed by several bodies, including the Fine Art Commission. A settlement has now been reached, and it is hoped that the work will be completed before the winter.

Improvements are to be made to the street lighting arrangements at SHEPTON MALLET. A provisional scheme has been prepared for twenty-three lamps and the Rural District Council has agreed in principle to the adoption of mercury vapour lighting for the central area.

BOLTON Lighting Committee has received the sanction of the Ministry of Housing and Local Government to the borrowing of £10,080 for improved lighting in a number of streets.

STALYBRIDGE Baths and Lighting Committee reports that the Ministry of Transport has granted permission for part of the scheme for the conversion of street lighting from gas to electricity to be carried out at a cost of £3,500.

Work is to proceed on the installation of further trunk road lighting in SPALDING.

DONCASTER Corporation is recommended to approve plans for improved street lighting in a number of streets at an estimated cost of £10,213.

Electric lighting has recently been installed in the main streets of ALDRIDGE, Walsall, at a cost of £3,000.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—MELBOURNE.—7th October. State Electricity Commission of Victoria. Supply of oil immersed circuit reclosers and air break interrupter. (E.S.B. 2402/53. Ten/6983.)*

Brazil.—PORTO ALEGRE.—15th September. Comissao Estadual de Energia Electrica. Substation transformers. (E.S.B. 2419/53. Ten/6991.)*

Burma.—RANGOON.—25th September. Electricity Supply Board. Supply of transformers, switchgear and protective equipment. (E.S.B. 2054. Ten/6967.)*

East Riding.—30th September. County Council. Installation of electrical services at the proposed Driffield County Secondary School. County architect, Beverley.

Formosa.—TAIPEI.—25th September. Central Trust of China. Equipment for pulp and paper mill, including pumps and motors. (E.S.B. 2200/53. Ten/6988.)*

29th September. Supply of storage batteries and electrode assemblies. (E.S.B. 2646/53. Ten/7000.)*

Halstead (Essex).—12th October. R.D.C. Two sets of electrically driven borehole pumps and two vertical booster pumps. John Taylor & Sons, engineers, Artillery House, Artillery Row, Victoria Street, London, S.W.1.

Haverfordwest.—21st September. Borough Council. Street lighting equipment. (See this issue.)

India.—NEW DELHI.—15th September. Directorate General of Supplies and Disposals. Supply of 21 exhaust fans. (E.S.B. 2257/53. Ten/6980.)*

BOMBAY.—30th September. Electric Grid Department, Government of Bombay. Distribution transformers and boxes, insulators, guards and switches. (E.S.B. 2544/53. Ten/6992.)*

Middlesex.—16th September. County Council. Supply of electric lamps for one year. (See this issue.)

Mildenhall.—11th September. R.D.C. Vertical spindle borehole pumps, complete with shaft, motors and switchgear. Silcock & Simpson, engineers, 10, Park Row, Leeds, 1.

New Zealand.—WELLINGTON.—13th October. Post and Telegraph Department. Supply of 36 humidistats. (E.S.B. 1870/53. Ten/6960.)* 14th October. Supply of 100,000 insulators. (E.S.B. 2185/53. Ten/6972.)*

South Africa.—DURBAN.—11th September. Corporation. Supply of telephone cable loading coils. (E.S.B. 2380/53. Ten/6981.)*

Stockton-on-Tees.—28th September. Corporation. Electrical installation in proposed Roseworth Junior School. Borough architect, 28, The Square.

*Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Isle of Ely.—County Council Education Committee. Recommended. Installation of electricity at Lerowe Road New Infants' School, Wisbech (£1,837).—Eastern Electricity Board.

Manchester.—Housing Committee. Electrical installation work in 124 houses, Langley estate, Middleton.—F. W. Cole & Son, Ltd.

Nantwich.—R.D.C. Electrical installations in 82 houses, various sites (£2,048).—Harrison's (Northwich), Ltd.

Newcastle-under-Lyme.—Highways Committee. Recommended. Supply and erection of lighting equipment for roads on various Council estates (£8,575).—North Midlands Engineering Co., Ltd.

Corporation. Recommended. Electrical installation work at Langdale C.P. School (£1,307).—J. Bagguley & Son.

Northwich.—R.D.C. Electrical installations in 88 houses, Leftwich estate (£1,576).—Wm. Parks.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashby-de-la-Zouch.—Factory for Meredith & Drew, Ltd.; Taylor Roberts & Bowman, architects, 10, Clegg Street, Oldham.

Berwick.—Factory, Tweedside trading estate; J. L. Thomas, breeze block and concrete utility manufacturer, Ashington.

Birmingham.—Works extensions, Long Acre, Nechells; L. H. Newton & Co., Ltd., bolt, nut and screw manufacturers, Thimble Mill Lane.

Large extensions to the Norfolk Hotel, Hagley Road, including three extra bedroom floors; resident manager.

Bishop Auckland.—Houses (26), four shops and two flats on the Woodhouse Close estate; U.D.C. surveyor, Town Hall.

Bolton.—Works extensions and office premises; J. Young & Sons, Ltd., engineers, Kay Street.

Boroughbridge (York).—Farmhouse and complete set of farm buildings at Marton-cum-Grafton, for West Riding C.C.; county land agent, County Hall, Wakefield.

Bournemouth.—Dwellings (106), Fernheath Road; borough architect.

Brighton.—Factory, Bevendean area; W. G. Phillips, surveyor, 11, New England Road.

Central nursery, Stanmer Park (£45,000); borough surveyor, 26-30, King's Road.

Chester.—Factory, Sealand Estate, for Serck Radiators, Ltd.; P. H. Lawson, architect, 2, Pepper Street.

Cradley Heath.—Factory on site at Old Hill; W. B. Cull & Sons, Ltd., engineers, Tennant Street, Birmingham, 15.

Ealing.—Secondary grammar school, Eliots Green, Northolt (£165,770); Middlesex county architect, 10, Great George Street, S.W.1.

Eastbourne. — Development of estate at Ocklynge Farm, providing for a large number of houses and flats; borough surveyor, 2-4, Saffrons Road.

Eccles.—Houses (306), on the Brookhouse estate; G. O. Jones, town clerk, Town Hall.

Elstree.—Houses (46), Cowley Hill estate, for R.D.C.; D. Howell, surveyor, Council Offices, Shenley Road, Boreham Wood.

Epping.—C. of E. school at North Weald (£40,000); H. Conolly, Essex county architect, County Hall, Chelmsford.

Eston. — Children's home, Clynes Road, Grangetown, for North Riding C.C.; county architect, County Hall, Northallerton.

Gainsborough.—Fire and ambulance station (£29,850); county architect, Lincoln.

Harrow.—Girls' secondary grammar school, Clamp Hill (£176,100); Middlesex county architect, 10, Great George Street, S.W.1.

Huyton-with-Roby.—Houses (34), on St. John's Road East site, 5th portion; chief architectural assistant, Council Offices, Derby Road.

Kidsgrove (Staffs).—Houses (218), Rookery and Galleys Bank; O. Lloyd Hurst, clerk to U.D.C., Town Hall.

Lanchester.—Houses (150); R.D.C. surveyor.

Leeds.—New Halton Grammar School; Yorke Rosenberg & Mardall, architects, 2, Hyde Park Place, London, W.2. Stanks County Primary School; W. Tocher, architect, 8, Blenheim Terrace, Leeds.

London. — HACKNEY. — Flats (32), Clapton Common; borough engineer.

PADDINGTON.—Children's library, Queen Park; borough engineer.

WANDSWORTH.—Three-storey block of flats in Allfarthing Lane, and 12 houses in St. Ann's Hill; C. Lovett Gill, architect, 41, Russell Square, W.C.1.

Maidstone. — Flats (88), Shepway Farm estate; borough engineer.

Maldon (Essex).—Houses in pairs (46), St. Peter's Avenue; borough surveyor, Municipal Offices.

Middlesbrough. — Houses (727), Pallister Park site; borough engineer, Municipal Buildings.

Minehead.—Industrial premises; Donati & Torrens, architects, 13, The Parade.

Mitcham.—Houses for aged persons (66), on three sites; R. H. White, town clerk, Town Hall.

Morecambe.—Houses and flats (51), Branksome Drive estate; R. Rose, town clerk.

Morley.—Maternity and child welfare clinics on site in Corporation Street; West Riding county architect, Westfield Road, Wakefield.

Morpeth.—Houses (23), Spelvit Lane estate; F. K. Perkins, borough engineer.

Newbury.—Houses (146), Valley Road estate; borough engineer.

Newcastle-on-Tyne. — Flats (72), Kenton North; city architect, 18, Cloth Market.

Newton Aycliffe (Co. Durham).—Cinema for the Aycliffe Development Corporation, Newton Aycliffe; G. A. Goldstraw, chief architect.

Northampton. — Out-patients' department at hospital; Sir John Brown, Henson & Partners, architects, 30, Billing Road.

Ormskirk.—Fire station (£23,000); county architect, Preston.

Portsmouth.—Flats (28), St. Paul's Square; city architect.

Rotherham.—Works extensions, Don Street; Guest & Chrimes, Ltd., waterworks fittings makers.

Kimberworth Park Primary School; borough engineer.

Scunthorpe.—Infants' school, Riddings area (£37,000) and junior school, Church Farm estate; county architect, Lincoln.

Shrewsbury.—Houses (196), Meole Brace estate and 30 houses on the Springfield estate; borough surveyor, Guildhall.

Stafford.—Power house, administration buildings, pumphouse, etc., at new sewage disposal works; T. H. Higson, borough surveyor, Mount Street.

Stoke-on-Trent. — Extensions to works (£27,500); Michelin Tyre Co., Ltd., Boothen Estate.

Surbiton.—Bakery, depot and offices, Cox Lane and Davis Road; J. Lyons & Co., Ltd., Cadby Hall, W.14.

Taunton.—Sewage disposal works and pumping station; A. H. S. Waters, consulting engineer, 25, Temple Row, Birmingham, 2.

Tottenham.—Houses (32), on the Markfield estate, Block 4; borough surveyor, Town Hall, London, N.15.

Walsall.—Flats (40), Lower Rushall Street; borough surveyor, Council House.

Walton-on-Thames.—Flats (16), Thrupps Lane; John Farmer, Ltd., builders, 45, Hanworth Road, Sunbury.

Wardley (Co. Durham).—Methodist church (£30,000); Fennell & Co., architects, Bridge End Chambers, Chester-le-Street.

Washington (Durham).—Bus station (£9,500); T. E. Crowe, U.D.C. surveyor.

Westmorland.—Additions to Appleby Grammar School (£25,000); J. Kitchen, builder, Penrith, Cumberland.

Whitby.—Fifty "Unity" houses at White Leys; U.D.C. surveyor, St. Hilda's Terrace.